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PHYSICAL GROWTH AND SCHOOL PROGRESS

A STUDY IN EXPERIMENTAL EDUCATION

By BIRD THOMAS BALDWIN

PROFESSOR OF PSYCHOLOGY AND EDUCATION
IN SWARTHMORE COLLEGE

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LETTER OF TRANSMITTAL.

Department of the Interior,
Bureau of Education,
Washington, November 4, 1913.

Sir: There is a growing conviction on the part of teachers and students of education that there must be a close relation between the physical and mental development of children and that this relation must be known and respected. As yet, however, we have little definite knowledge on the subject. Guesses and theories based on scant and unscientific observations are easily made and are numerous. Sound knowledge can be had only by careful scientific investigation—thoughtful interpretation of accurate observations made under proper control. The accompanying manuscript, by Dr. Bird T. Baldwin, professor of psychology and education in Swarthmore College, embodies the results of a study of the physical growth and the school standing of a group of boys and girls between the ages of 6 and 18 years observed consecutively and makes, I believe, a valuable contribution to the literature of this subject. I recommend that it be published as a bulletin of the Bureau of Education.

Respectfully submitted.

P. P. Claxton,
Commissioner.

To the Secretary of the Interior.

FOREWORD.

It should now be recognized that every child has at least five parallel ages: A *chronological* age, in years, months, and days; a *physiological* age, indicative of physical growth and maturity; a *mental* age, significant of intellectual capacity and ability; a *school standing*, or *pedagogical*, age, denotative of relative position in school grades; and a *moral* or *religious* age. These ages may or may not coincide in their stages of development. In a first-class school the school standing, or pedagogical, age and the mental age would be the same.

This monograph aims to present the results of a study of the physical growth, or *physiological* age, and the *school standing* of a group of boys and girls from 6 to 18 years of age when observed consecutively.

The scope or field of the investigation includes:

(1) A series of norms based on the height and age distribution, and weight and age distribution; the averages and average variations of individual increments of growth in height, weight, and lung capacity; and the individual growth curves in height, weight, and lung capacity, with health notes and weight-height and vital indexes.

(2) An investigation on school standing in marks, grades, and ages.

(3) The relation of physical development in height, weight, and lung capacity to school standing.

(4) A brief historical summary of the work in this field, with an annotated bibliography.

The chief value of the monograph consists in the fact that it is the first attempt to follow consecutively the same groups of children through the elementary and high schools, either in physical growth or school standing, or the relation of the two. Since the curves and records represent individual histories, they will be of permanent value. The monograph also aims to give the present status of the problem of physical growth.

The contents of the monograph are discussed from four points of view, in order to meet the needs of the wide range of interests of the individuals into whose hands it may fall. The aim, scope, methods, and results of the investigation are first discussed under the headings: (I) *The general problem*, which suggests the salient points without data or proof; the second section, (II) *The investigation*, includes a de- [illegible] ient with specimen charts and tables with proofs and comments; the third section, (III) *The statistical material,* gives practically all of the data for detailed study as a basis for further investigations; and then follow the fourth section, (IV) *An historical summary of investigations in physical growth,* and a fifth section, (V) *An annotated bibliography of 336 titles.*

The conclusions drawn from the study are limited to the data at hand, which have been obtained from a detailed study of a limited number of individuals in a special type of schools where the facilities for measurement are excellent and where much attention is given to physical examinations and remedial training. The children, as a rule, come from "well-to-do" families. The heredity and health notes are given as far as possible for all whose growth curves are plotted. The writer has been collecting his data for several years, and no effort has been spared to secure the best available material in this country.

PHYSICAL GROWTH AND SCHOOL PROGRESS.

I. THE GENERAL PROBLEM.

Teachers, psychologists, physicians, and parents are necessarily concerned with the physical growth and mental development of boys and girls. So much has been written within these two fields that we are now in a position to ask more detailed and specific questions in regard to particular periods or nodes of development. In our modern work in experimental education we greatly need consecutive studies through a long series of years, giving full, accurate, and systematic accounts of the physical growth and school progress of the same individuals. In previous studies, with a very few exceptions, it has been the method to measure or study a large group of children for one age, another group for the following age, another for the next subsequent age, and so on for the series included, and to derive a general average or conclusion from these data. For example, 1,000 children were measured for 6 years of age, another 1,000 at 7 years of age, and another at 8, and so on. The average for these groups gave some insight into how one child grew from year to year.

The present investigation makes an individual study of children from three of the very best schools in America, and presents consecutive observations as far as these were available. It aims to show, aside from the conclusions that the data furnish, the urgent need and necessity of life histories in all phases of educational work, if our subject is to be developed scientifically. The period covered is from 6 to 18 years of age, and the children have been under school medical inspection, directed play, and physical education. That these factors are important educational agencies is shown by the fact that, on the average, these children from the Horace Mann School, the University of Chicago Elementary and High School, and the Francis W. Parker School are taller and heavier than any other group of children so far recorded among over a million studied. The 33,840 measurements are unusually good, since they have been made continuously on nude children by trained anthropometrists who recorded the age in days, the measurements in small units, and the various health notes.

Among the important questions that this monograph aims to help answer are the following: What is the normal rate of growth for a child within a given group? How do children grow from year to year? What are the periods of accelerated or delayed growth? What relation does the growth of any one age or period have to subsequent periods? Do children retain their relative positions in height, weight, and lung capacity throughout their school course? If so, will these individual studies help to anticipate how tall a normal child will be at any subsequent year? What is the relation of growth in height to weight, and the relation of growth in lung capacity to weight, since these are the best criteria of nutrition and robustness of an individual? Are some children more mature physiologically at a given chronological age than others? If so, what relation does this accelerated physiological maturity bear to growth? How is growth enhanced, how arrested?

We shall never be able to answer all these questions completely until we have complete individual histories for all classes of children, but the individual records and the growth curves which we have worked out should be of value for such comparative studies. The individual records are given in Tables 4, 5, and 13 to 22 and figures 1 to 28.

For purposes of comparison with a norm (or average child for this group) the distribution Tables 2 and 3 may be consulted, and also the averages in Table 3. The increments of growth or the amount the child grows from year to year, or half year to year, may be obtained from Tables 4 and 5, and the largest individual measurements with per cents of gain from Table 8. The general conclusions are given on page 69, and while they have a very general application in various directions, they are limited in their strictest validity to the data included in this investigation.

The second section (B) of the investigation follows the same individuals through their school subjects from grade to grade. The data consist of 21,682 final term marks from the Horace Mann and Francis Parker Schools. It must be recognized, since we are investigating the school standing age and since the promotions are based on marks, that these records must be taken at their face value, because they represent school practice and because they offer tangible criteria of the efficiency of the individual and of the school.

The 11 charts give graphically the average mark, the age, and school grade from year to year in the school progress. These conclusions may be found on page 79.

After the question of normal, accelerated, and retarded school progress has been discussed empirically, the relation of physical growth to school standing is taken up on pages 71–97 in regard to height, weight, and lung capacity, with educational corollaries. The statistical material follows, and after this the historical summary.

II. THE INVESTIGATION.

(A) PHYSICAL GROWTH.

1. THE DATA.

The investigation on physical growth, as here reported, is based on the consecutive measurements at yearly and half-yearly intervals, or both, of 861 boys and 1,063 girls from the University of Chicago elementary and high schools, the Francis W. Parker School of Chicago, and the Horace Mann School of Teachers College, Columbia University. The records include consecutive measurements on the same individuals for periods of from 3 to 12 years, giving a sum total of 12,500 measurements for height, 11,220 for weight, and 10,120 for lung capacity, or 33,840 measurements. In the general averages of the increments, the measurements of the Horace Mann School are for five or more consecutive years, and were taken, as a rule, at yearly intervals during the three fall months. The Francis W. Parker records were taken semiannually, during October and June, and the University of Chicago schools semiannually in about one-fifth of the records included and in the remainder annually. The individual records from these latter schools contain, in the distribution tables, a few consecutive measurements for periods of less than five years.

The measurements were made by the regular trained examiners and anthropometrists in the various schools, except in a few instances in the University of Chicago schools, where they were taken by the writer.[1] The children were nude, and the records for height were taken in millimeters or tenths of an inch; for weight they were recorded in decigrams or in tenths of a pound; for lung capacity deciliters or tenths of a cubic inch were used. At the Horace Mann School the unit of weight was changed from pounds to kilograms in 1905; at the University of Chicago schools kilograms and inches were changed to pounds and centimeters in 1904 and back to kilograms in 1910. The units also varied in a few cases at the Francis W. Parker School. This changing of units necessarily introduces a small error involved in the reduction of a fractional part of a large unit to a smaller unit, since it is more difficult to measure accurately with large units, and to further subdivide the unit after the measurement has been made increases any slight error involved in measuring.

---

[1] The writer is indebted to Profs. Charles H. Judd, Walter F. Dearborn, and Frank N. Freeman for helpful suggestions in methods of undertaking the investigation; to Drs. Raycroft, J. Anna Norris, Walter D. Wood, William H. McCastline, Clement L. Vaughan, and to Jeannette Seibert and Miss Flcra L. Cook for assistance in obtaining records. The following graduate students have helped to check some of the tabulated results: Misses Miriam E. Dozier, Carrie Saunders, and Julia Cooper, of the University of Texas, and J. A. Blackburn and Grace W. Greene, of Swarthmore College.

A large majority of the measurements were reported in millimeters, tenths of pounds, and tenths of cubic inches, and these units are used in the preparation of the tables and charts presented in this study.

2. METHODS OF TABULATION.

In order to facilitate methods for using the data and to obtain the yearly and half-yearly increments, each individual's records, together with the name or number, date of birth, and date of physical examination, were copied on small cards and later transferred to large sheets with the measurements and increments in opposite columns in order that the correlations between the initial measurement and the appended increments could be noted. This made it possible also to determine the effects of accelerated or arrested growth on succeeding periods, since a number of increments on the same individual were available.

Horace Mann School.

Name, ...; 2097 (boy); born June 2, 1899.

Date of measurement.	Jan. 9, 1903.	Oct. 27, 1903.	Feb. 3, 1905.	Nov. 1, 1905.	Nov. 19, 1906.	May 4, 1907.	Dec. 6, 1907.	Dec. 9, 1908.
Age (yrs. mo. da.)	3—7—7	4—4—25	5—8—1	6—4—29	7—5—17	7—11—2	8—6—4	9—6—7
Weight, pounds	36.25	40.50	45.75	47.90	54.24	56.54	59.72	66.44
Weight, kilograms	16.50	18.37	20.75	21.73	24.20	25.70	27.10	30.20
Height, centimeters	103.4	108.0	116.4	121.4	127.5	130.4	133.7	139.2
Lung capacity, cubic inches	20	30	74	90	106	108	118	120
Lung capacity, liters	.33	.49	1.21	1.47	1.73	1.77	1.93	1.96
INDICES.								
Weight-height	.160	.170	.173	.178	.197	.197	.200	.217
Vital	.019	.026	.057	.067	.071	.070	.071	.064

Height and weight measurements of Horace Mann boys, with yearly gains.[1]

			Gain.		*Gain.*		*Gain.*		*Gain.*
No. 1.									
Age (years)	14½	15	....	15½	....	16	....	16½	....
Height (centimeters)	164.3	....	....	170.1	5.8	....	....	173.7	3.6
Weight (pounds)	102.0	....	....	111.4	9.4	....	....	12.1	9.7
No. 2.									
Age (years)	14½	15	....	15½	....	16	....	16½	....
Height (centimeters)	171.7	....	....	175.8	4.1	....	....	176.2	.4
Weight (pounds)	134.5	....	....	140.5	6.0	....	....	149.5	9.0
No. 3.									
Age (years)	14½	15	....	15½	....	16	....	16½	....
Height (centimeters)	159.2	....	....	168.7	9.5	....	....	175.0	6.3
Weight (pounds)	102.0	....	....	117.5	15.5	....	....	128.0	10.5

---

[1] The normal height of a boy 15 years of age is 164 centimeters, and the normal weight 106 pounds.

Specimen transfer sheet.

This method is illustrated on the increment sheets that follow—Tables 4, 5, and 13–22. For averages and average variations of increments, six-month intervals were used. For example: 12–12½, 12½–13, 13–13½, 12–13, 12½–13½.

To find the increments of growth in height, weight, and lung capacity for each individual, the ages at the time of measurement were first found for years, months, and days, but, in order to place the measurements for each individual into groups of yearly and half-yearly intervals, those made within three months and nine months above the year were considered as half years and the following interim, between nine months and the next three months, as full years. If two measurements fell within a six-months' period, the measurement nearest the age required by the interval was taken. No child's measurements, when placed in the yearly or half-yearly group, are more than three months from the exact age of the child, based on the date of last measurement and the date of birth. All measurements for more than a year's interval were necessarily eliminated in the calculation of the increment.[1]

3. HEIGHT AND AGE DISTRIBUTION.

The height and age distribution table includes records of three or more measurements of pupils in the University of Chicago schools and the Francis W. Parker School. The roman numerals refer to boys and those in italic to girls. The table otherwise is self-explanatory. In general, there is a fairly normal distribution of individuals slightly above the average or median height found by other investigators. These norms were found in order to determine the relative median heights and weights (i. e., the measurements above which and below which lie an equal number of individual measurements)[2] of the Chicago schools for a means of comparison with the groups of children studied by former investigators and for comparison with the norms used by Dr. Wood, of the Horace Mann School. The derived norms show, among other things, that the Chicago schools and the Horace Mann School form practically a homogeneous group in regard to height and age distribution of pupils. The differences of the two groups will be noted later, when a comparison of the growth curves of individuals is made.

---

[1] The writer wishes to take this opportunity to emphasize the urgent need of a long series of consecutive measurements on the same group of individuals, taken at the same time of day, by the same examiner, at regular six-months' intervals from the child's birthday, using throughout uniform units of measurements.

[2] The formula is $m = \frac{n+1}{2}$.

TABLE 1.—*Height and age distribution—University of Chicago*

[Number of individuals—Boys, 501; girls, 703; total, 1,204.

Height.		Age in years.																					
		6		6½		7		7½		8		8½		9		9½		10		10½		11	
		B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
Centimeters.	*Inches.*																						
115	45.276	2	*3*	2	*4*	3	*3*	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
116	....	2	*2*	1	*8*	2	*4*	...	...	2	*3*	...	*1*	1	*1*	...	...	...	...	...	...	...	...
117	....	2	*2*	1	*3*	2	*6*	3	*1*	1	*3*	...	...	1	...	...	...	...	...	...	...	...	...
118	....	1	*3*	4	*4*	2	*8*	2	*3*	1	*2*	...	*1*	...	*1*	...	...	...	...	...	...	...	...
119	....	3	*1*	2	*4*	2	*2*	1	*4*	1	*3*	...	...	...	...	...	...	...	...	...	...	...	...
120	47.245	3	...	1	*1*	3	*3*	2	*4*	1	*6*	1	*2*	1	*1*	1	...	1	...	...	...	...	...
121	....	1	*1*	1	*3*	3	*1*	4	*5*	3	*5*	...	*2*	...	*3*	...	*1*	...	...	...	...	...	...
122	....	1	*1*	...	*2*	3	*7*	4	*2*	1	*6*	1	*8*	1	*2*	...	*2*	1	...	...	...	...	...
123	....	...	...	4	*4*	3	*4*	2	*3*	2	*8*	1	*4*	2	*5*	2	*1*	...	...	...	...	...	...
124	....	...	*1*	1	*2*	2	*4*	1	*6*	2	*7*	4	*5*	3	*4*	...	*4*	2	...	...	...	2	...
125	49.213	2	...	1	...	3	*1*	6	*2*	3	*2*	1	*4*	2	*6*	2	*5*	2	*1*	1	...	1	...
126	....	...	...	2	*2*	1	*1*	2	*2*	3	*9*	4	*11*	3	*6*	5	*4*	2	...	2	*1*	1	...
127	....	...	...	1	*1*	1	*1*	3	*3*	4	*6*	2	*3*	3	*6*	1	*4*	...	*2*	...	*1*	1	...
128	....	...	...	...	*1*	3	*4*	3	*1*	1	*3*	2	*6*	4	*5*	3	*6*	1	*5*	1	*1*	1	*1*
129	....	...	...	...	...	1	*3*	3	*1*	5	*5*	4	*3*	3	*3*	3	*7*	3	*2*	1	*4*	...	*3*
130	51.182	...	*1*	...	...	1	...	4	*2*	6	*5*	2	*6*	7	*5*	6	*8*	7	*5*	2	*2*	5	*1*
131	....	...	...	...	...	1	...	...	*3*	1	*2*	3	*1*	3	*6*	4	*9*	2	*7*	3	*3*	1	*1*
132	....	...	...	1	...	...	...	1	*5*	5	*2*	3	*2*	4	*8*	3	*9*	3	*5*	4	*4*	...	*1*
133	....	...	...	...	...	...	*1*	1	*1*	1	*2*	4	*2*	5	*5*	3	*2*	3	*6*	5	*2*	6	*3*
134	....	...	...	...	...	...	...	1	...	1	*5*	3	*2*	6	*1*	6	*2*	5	*9*	3	*8*	10	*4*
135	53.150	...	...	...	...	...	...	...	...	1	*2*	2	*1*	5	*3*	3	*3*	3	*10*	4	*6*	4	*4*
136	....	...	...	...	...	...	*1*	...	...	1	...	2	*1*	2	*4*	3	*3*	7	*8*	5	*6*	8	*3*
137	....	...	...	...	...	...	...	...	...	...	...	4	*4*	2	*4*	7	*3*	4	*4*	2	*7*	4	*8*
138	....	...	...	...	...	...	...	...	...	1	...	1	*1*	2	*3*	9	*1*	5	*8*	3	*9*	5	*9*
139	....	...	...	...	...	...	...	...	...	2	...	1	...	1	*2*	1	*2*	4	*4*	5	*1*	8	*11*
140	55.192	...	...	...	...	...	...	...	...	...	...	1	...	2	*2*	1	...	6	*2*	6	*6*	1	*9*
141	....	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	*4*	9	*2*	3	*4*	1	*9*
142	....	...	...	...	...	...	...	...	...	...	...	...	...	...	*1*	2	*2*	1	*5*	1	*4*	5	*2*
143	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	*1*	3	*1*	8	*4*	3	*6*
144	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	*2*	1	*2*	3	*2*	4	*2*
145	57.089	...	...	...	...	...	...	...	...	1	...	...	...	...	...	2	*1*	1	*1*	4	*3*	8	*5*
146	....	...	...	...	...	...	...	...	...	...	...	...	*1*	...	...	...	...	1	*1*	1	*2*	6	*10*
147	....	...	...	...	...	...	...	...	...	...	...	...	...	...	*1*	1	...	...	*2*	2	*1*	6	*4*
148	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	*1*	4	*3*
149	....	...	...	...	...	...	...	...	...	...	...	...	...	1	*1*	...	...	...	...	1	*2*	1	*5*
150	59.056	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	*1*	3	*2*
151	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	*1*
152	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	*1*	...	...
153	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	*1*
154	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*1*
155	61.023	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*1*
156	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*1*	...	...	...	...
157	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
158	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
159	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
160	62.933	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
161	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
162	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
163	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
164	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
165	64.961	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
166	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
167	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
168	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
169	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
170	66.930	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
171	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
172	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
173	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
174	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
175	68.898	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Number of individuals...		28	*41*	29	*50*	43	*58*	47	*54*	52	*87*	48	*71*	66									
Median..................		116	*114*	119	*117*	121	*121*	125	*123*	128	*125*	131	*126*	131									

elementary and high schools and Francis W. Parker School.

Number of measurements—Boys, 1,586; girls, 2,358; total, 3,944.]

Age in years.																												No. of cases.	
11½		12		12½		13		13½		14		14½		15		15½		16		16½		17		17½		18			
B.	G.	B.	G	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	10
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	19
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	15
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	22
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	14
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14	17
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12	21
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12	30
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16	29
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17	33
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24	21
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25	36
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16	27
...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	33
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25	31
1	1	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	42	37
...	1	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	33
1	3	2	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	29	39
1	2	2	3	1	1	1	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	35	30
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	36	32
...	3	3	2	3	1	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30	35
4	3	...	1	...	...	2	1	1	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	34	33
3	3	5	6	3	2	1	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	36	41
4	5	6	7	2	2	1	3	1	...	1	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	43	48
4	5	1	4	4	3	2	1	1	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	35	36
5	6	8	9	3	5	3	1	2	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	39	42
3	6	6	3	2	10	4	...	1	2	2	3	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	37	43
4	3	5	5	4	8	2	3	1	4	2	3	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28	42
3	5	7	7	6	2	2	5	3	1	3	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	43	34
4	5	5	10	2	2	4	6	2	2	2	1	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...	1	32	37
5	6	9	3	6	4	4	5	2	6	3	2	1	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	47	37
2	6	6	8	7	4	4	4	4	2	4	6	1	2	1	2	1	...	...	...	...	...	...	...	...	...	...	...	38	48
1	4	10	6	1	7	6	4	1	5	2	1	...	2	1	4	3	1	...	...	...	...	...	1	...	...	...	...	34	44
2	4	4	2	4	6	4	4	1	6	5	6	...	1	...	2	...	2	...	...	...	...	...	...	...	...	...	...	30	36
3	9	6	6	2	3	5	11	4	3	4	8	1	2	2	...	...	3	1	1	...	1	...	1	...	...	...	...	31	55
1	4	7	7	6	3	4	4	3	3	6	4	4	6	1	8	1	5	...	1	...	1	...	1	...	...	...	1	37	51
4	1	1	6	2	5	2	9	3	4	5	6	2	2	3	11	2	1	...	3	...	2	...	2	...	...	...	...	26	53
...	2	6	7	2	7	6	9	6	2	6	9	3	5	3	1	...	4	...	5	...	1	...	2	...	...	...	1	33	56
1	3	1	4	3	4	4	11	3	7	5	10	3	2	3	6	...	1	...	3	...	1	...	2	...	2	...	2	25	59
1	1	2	6	2	6	4	4	6	4	6	10	2	14	2	11	2	12	1	3	1	2	...	2	...	1	...	1	29	78
1	...	2	1	5	5	6	1	3	8	9	12	5	9	5	8	1	3	2	11	...	1	...	4	...	2	...	4	39	71
...	...	2	5	2	5	7	9	3	5	10	8	4	9	3	6	3	3	1	8	1	6	...	9	...	3	...	4	36	80
...	3	3	3	...	4	6	8	...	6	7	15	1	8	5	10	1	6	1	5	2	4	1	8	...	4	1	5	28	89
...	1	...	6	3	3	1	7	1	6	5	11	5	10	1	11	...	8	1	4	1	3	1	6	...	2	1	3	21	81
...	...	...	...	...	5	1	9	5	5	7	9	8	11	6	8	1	5	...	6	...	6	2	6	...	1	...	6	30	77
...	...	...	...	...	...	3	5	1	5	4	17	1	6	1	13	2	3	1	11	2	2	2	4	...	2	...	4	17	72
...	...	...	...	1	1	2	3	2	5	7	5	3	1	...	6	3	7	1	6	1	5	1	6	...	3	1	3	22	51
...	...	...	...	1	...	2	4	...	8	3	8	1	7	1	5	...	5	3	8	1	...	1	4	1	1	1	5	15	56
...	...	...	...	1	...	...	3	2	1	...	9	4	7	...	14	3	4	4	7	1	6	1	3	1	1	1	4	18	59
...	...	...	...	...	...	1	3	1	3	3	9	2	7	4	2	2	3	3	9	1	5	2	2	1	1	1	6	21	60
...	...	...	...	...	...	...	2	...	2	2	1	4	6	2	6	2	3	1	...	4	2	1	2	2	2	1	3	19	29
...	...	...	...	...	...	...	...	1	...	...	2	4	1	3	9	3	1	2	3	2	4	2	3	1	3	1	2	19	28
...	...	...	...	...	...	...	...	...	1	1	3	1	2	10	3	3	3	5	6	1	3	2	1	2	2	2	6	29	30
...	1	...	...	...	...	...	1	3	...	2	1	2	1	4	2	5	2	6	4	1	1	1	1	1	2	1	6	26	22
...	...	...	...	...	...	...	...	...	...	1	1	3	2	1	4	3	3	1	2	2	1	1	2	1	1	1	1	14	17
...	...	...	1	...	...	...	...	...	1	1	2	...	...	4	1	2	2	1	...	1	3	1	4	1	1	1	2	12	17
			...	...	...	1	...	...	1	1	...	1	...	5	2	1	1	2	...	1	...	4	6	3	1	2	3	21	14
						...	2	...	...	...	1	3	1	8	...	1	2	1	2	2	...	2	3	2	...	2	1	19	12
							...	...	...	...	1	1	...	...	...	...	1	2	...	1	...	3	1	2	1	2	1	11	5
							...	...	...	...	...	...	2	1	1	2	2	2	...	2	...	2	1	2	...	1	...	12	6
								...	1	...	...	1	...	1	...	1	...	1	...	2	...	3	1	1	...	...	1	10	3
											185	80	132	84	158	55	97	52	109	33	61	40	89	25	56	28	77		
											157	159	157	164	159	164	159	167	160	166	160	170	160	170	161	170	162		

In order to accommodate Table 1 to the size of the printed page, it has been necessary to take out the following measurements from that table:

At 106 centimeters—girls, one 6½ years old; at 108 centimeters—girls, one 6 years old, one 6½ years, and boys, one 6 years old; at 109 centimeters—girls, two 6 years old, and boys, one 6 years old, two 7 years; at 110 centimeters—girls, one 6 years old, five 6½ years, one 7 years, two 7½ years, and boys, two 6 years old, and two 6½ years; at 111 centimeters—girls, two 6 years old, two 6½ years, and boys, one 6 years old, two 7½ years; at 112 centimeters—girls, eleven 6 years old, one 7 years, one 8 years, and boys, three 6 years old, one 7 years; at 113 centimeters—girls, three 6 years old, one 6½ years, one 8 years, and boys, two 6 years old, two 6½ years, one 7 years, two 7½ years, two 8 years; at 114 centimeters—girls, six 6 years old, one 6½ years, three 7½ years, and boys, one 6 years old, two 6½ years, four 7 years, one 7½ years, one 8½ years; at 176 centimeters—girls, one 15½ years old, one 16 years, and boys, one 14 years old, one 15½ years, three 16 years, one 16½ years, two 17 years, one 17½ years, one 18 years; at 177 centimeters—girls, one 17 years old, one 17½ years, one 18 years, and boys, one 16 years old, one 16½ years, one 17 years, one 17½ years, one 18 years; at 178 centimeters—girls, one 14½ years old, and boys, one 15 years old, one 15½ years, one 16 years, two 17 years, two 18 years; at 179 centimeters—boys, one 14½ years old, one 15½ years, two 17 years, one 17½ years, two 18 years; at 180 centimeters—boys, one 15 years old, one 17½ years; at 181 centimeters—boys, one 15½ years old, one 18 years; at 182 centimeters—boys, one 14½ years old, one 16 years; at 183 centimeters—boys, one 14½ years old, one 16½ years; at 184 centimeters—boys, one 16 years old; at 186 centimeters—boys, one 14½ years old.

The extremes in growth to be noted are marked, in that the tallest boy at 15½ years of age is 49 centimeters taller than the shortest; the tallest girl at 13½ years of age is 39 centimeters taller than the shortest. The widest range of differences is during the adolescent age, where there is a slight tendency toward bimodal distribution (i. e., two groups of cases appear with central tendencies for each); this appears for boys at 13 and for girls at 12½. The boys are taller than the girls from 6 to 11 years of age; the girls then become taller and remain so until 14½, when the boys are taller. This is graphically shown by the solid and the leader lines drawn transversely in the charts. Those below these lines are tall individuals and those above are short individuals.

4. WEIGHT AND AGE DISTRIBUTION.

This distribution, like that of height, was taken for the University of Chicago schools and the Francis W. Parker School, in order to find a working norm. It is to be noted there is a much wider range of cases here than in the height distribution, and a more irregular surface of frequency for each age. The widest range of differences is found during the adolescent age, and in particular at the age of 15 years, where the heaviest boy weighs 110 pounds more than the lightest, and the heaviest girl 104 pounds more than the lightest. The boys are heavier than the girls from 6 to 12½ years of age; the girls then become heavier and remain so until 16, after which the boys again are heavier. The norms, like those of height, are above the averages derived by other investigators who have used but [illegible] measurement for each individual.

The table is self-explanatory and is uniform in that of height.

The norms obtained in this table are, of course, least satisfactory for the lower and upper ages, where there are few cases. For several ages the same individual measurements occur, thus making the table approach what it would be if a homogeneous group were used for all ages from 6 to 18.

The weight table is uniform in construction with the height table, and the same individuals are used. Since the measurements here were taken in pounds, in place of kilograms, the distribution of pounds is retained for years and half years, and the kilogram equivalents are given for every 5 pounds, beginning with 35 pounds.

TABLE 2.—*Weight*

[Number of individuals—Boys, 460; girls, 638; total, 1,098.

Weight.		Age in years.																					
		6		6½		7		7½		8		8½		9		9½		10		10½		11	
		B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
Pounds.	*Kilos.*																						
35	15.876	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	......	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	......	...	3	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	......	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	......	1	4	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	18.144	1	1	...	1	1	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...
41	......	1	1	...	1	2	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	......	1	5	...	1	3	2	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...
43	......	2	4	2	1	2	4	2	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...
44	......	2	4	3	4	1	7	...	4	1	1	...	1	...	...	...	...	...	...	...	...	...	...
45	20.412	6	3	2	2	2	4	...	3	2	2	...	...	...	...	...	...	...	...	...	...	...	...
46	......	1	2	1	2	3	3	3	3	...	4	1	3	...	2	...	1	...	...	...	...	...	...
47	......	1	3	1	3	2	2	1	6	2	2	2	...	1	...	...	...	...	2	...	...	...	...
48	......	1	1	1	4	1	3	3	4	2	7	...	2	2	1	...	...	1	...	...	...	...	...
49	......	1	4	1	2	1	1	1	2	2	5	...	2	1	1	1	4	1	2	...	...	...	...
50	22.680	2	1	2	3	4	4	2	3	3	5	...	5	1	2	1	3	...	...	1	1	...	...
51	......	2	1	2	2	3	2	1	5	2	9	2	4	3	5	6	...	1	...	...	1	...	...
52	......	1	...	3	...	1	4	1	4	2	6	1	5	2	6	...	3	2	...	1	2	...	...
53	......	4	...	2	3	1	4	2	2	1	3	3	5	1	2	3	5	...	1	1	3	1	...
54	......	2	...	1	...	1	3	3	1	2	2	1	2	3	2	4	4	1	4	...	1	1	...
55	24.948	1	...	...	...	2	2	2	3	1	4	2	2	1	6	4	11	1	5	...	2	4	2
56	......	1	...	2	...	1	...	3	1	1	3	6	4	1	5	2	4	3	1	1	1	1	...
57	......	...	...	...	...	2	...	2	2	3	5	2	4	8	6	3	4	4	1	1	5	1	4
58	......	...	...	1	...	2	...	3	1	3	2	3	2	2	8	2	5	3	1	3	2	2	3
59	......	1	...	1	...	...	1	3	1	1	2	1	3	4	5	2	8	1	4	2	4	2	5
60	27.252	...	...	2	...	...	1	1	1	1	2	1	4	3	2	2	3	1	2	4	6	1	4
61	......	...	...	1	...	1	...	1	1	1	1	2	1	2	4	...	4	2	7	1	4	8	2
62	......	...	...	...	...	...	1	1	...	2	1	1	3	3	4	5	3	2	4	2	1	2	5
63	......	...	...	...	...	...	1	...	...	1	2	1	1	2	3	2	2	3	1	2	3	1	5
64	......	...	...	...	...	1	1	1	...	2	...	2	2	1	9	5	3	4	6	2	2	3	9
65	29.484	...	...	...	...	...	...	2	...	1	2	2	1	2	1	4	4	1	1	4	2	4	9
66	......	...	...	...	...	...	...	1	...	3	...	4	2	5	3	4	3	2	5	2	2	2	5
67	......	...	...	...	...	...	...	1	...	1	...	1	1	...	1	4	3	3	1	1	1	3	3
68	......	...	...	...	...	...	1	...	...	1	...	2	1	1	1	2	3	2	6	4	5	1	4
69	......	...	...	1	...	1	...	...	...	1	...	1	...	...	1	6	2	3	2	4	2	2	3
70	31.752	...	...	...	...	...	...	...	...	1	...	3	1	...	2	3	2	2	2	1	4	3	3
71	......	...	...	...	...	...	...	1	...	2	...	2	3	1	1	1	6	4	...	1	2	4	3
72	......	...	...	...	...	...	...	1	...	1	...	...	...	1	...	1	1	5	4	3	1	2	4
73	......	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	1	1	1	4	4
74	......	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	4	2	1	5	6	2
75	34.020	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	1	5	2	4	2	1	2
76	......	...	1	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	1	2	2	6	3
77	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	1	2	2	3
78	......	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	2	2	1	3	1
79	......	...	...	...	...	...	...	1	...	...	...	...	...	...	2	...	3	...	1	3	...	1	...
80	36.287	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	2	3	2	3
81	......	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	3	1	...	1	2
82	......	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	2	1	3	3
83	......	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	1	1	...	2	1
84	......	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	2	...	...	1	2	1
85	38.562	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2	...	1	...	2	2	1
86	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	2	1
87	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	2
88	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
89	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	...	1	...
90	40.823	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...
91	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
92	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
93	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2
94	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
95	43.091	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
96	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
97	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
98	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
99	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...

and age distribution.

Number of measurements—Boys, 1,475; girls, 2,103; total, 3,565.]

Age in years.																												B.	G.
11½		12		12½		13		13½		14		14½		15		15½		16		16½		17		17½		18			
B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.		
																													1
																													4
																													1
																												1	5
																												2	4
																												3	4
																												4	10
																												8	11
																												7	21
																												12	14
																												9	20
																												10	18
																												11	22
																												9	23
																												16	27
	2																											22	31
																												14	30
	1	1																										20	29
1	1																											20	20
	1				1																							18	39
																												22	19
1	2					1																						28	33
	2		2																									24	28
2	3		4	1																								21	40
	1	1	1	1			1																					18	28
2	1		2				1																					21	28
2	6	4	4	2		1																						27	32
3	1	1	3	2	3	2	2																					20	27
8	5		1				3																					29	41
2	4	1	3	2	1			1		1									2									27	30
	3	6	2	1	2		1																					30	28
3	5	2	4	1				1											1									21	20
1	2	2	2	4	5	1	3	1			2		4															23	39
1	4	1	2	6	1	3	1	1																				30	18
2	1	2	4	4	3	1	2							1														23	24
2	5	4	2	1	2			1	2	1	2							1										26	28
	2	3	5	4	5	2		1	2	1	1									1								26	25
3	4	3	5	5	2	4	1																					21	19
1	1	6	4	1	1	2	1	3	2	2	3	1	1															28	23
3	1	4	2	1	3	1	4	3	1	1	2				1													24	22
3	1	8	1	1	2	1	2	3	1	1						1												27	15
1	2	6	3	3	3	4	3			2				1														22	18
1	2	4	1	2	4	2	1	3	3	2	1	1	1															22	17
2	4	2	3	3	4	4	4	3	1	2	1	3	1	1			1	2										27	25
3	4	2	3	4	3	3	1	1	1	1	1	2					1											21	22
1	1	5	1	1	1	3	3	3		2	1	1	3															19	15
3	2	2	2	4	2	3	2		3	1		1	2	1					1				1				1	21	21
1	1	1	2	1	1	1	2	4	1	1	4		1	2					1									16	15
1	2	1	2	3	2	1	4	5	3	2	3			1	2				1				1					20	22
3	2	4	3	2	3	1	1	3	2	4	3		2	1	3													21	25
2	1	2	4	2	2	4	2		1	2	3		1	2	2		1	1										17	19
	3	6	2	4	1	2	3	4	2	3	2	3	1			1												26	16
	4	3	2	2	6	6	1	2	2	6	2		2	1	1		1	1			2		1		1		1	21	27
1	1	2	2	1	5	1	2	1	1	1	2	1	2	2	1	1	2	1										15	19
1	2		2	1	2	3	2	4	2	4	8	2	2		2				1				1	1				18	24
	1	2	2	1	1	2	2	1	2	3	2	2	2	2	4				1									13	17
	2		2	2	1	2	1	1	2	4	4	1	1	1	3	2							1		1			13	18
	2	2	1	1	2	1	4	4	2	3	1	2	1	1	4										1			15	20
	1	1			1	1	2	1	2	2	1	1	2	2	2	1	2		2	1			2					10	18
	4	1	1		2	2	2	1	1	3	2	1	1	1	4		1	1					1		1			11	22
		2	1	3	1	3	5	1	4	4	3	2	3	1	1	1	4	1	4		2	1	1					19	31
		1		1	2		2	1	1	2	8	1	4	1	1	1		1	2	1	1		1				1	10	24
	1	1			2	1	2	3	1	1	2	1	1	1	3	1		1		1			2					11	15
2	1		1	2	1	1	4	1	2	6	3	3	4	2	2	1	2	1	1			1			2			20	24

TABLE 2.—*Weight*

[Number of individuals—Boys, 460; girls, 638; total, 1,098.

Weight.		Age in years.																					
		6		6½		7		7½		8		8½		9		9½		10		10½		11	
		B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
Pounds.	*Kilos.*																						
35	15.876																						
36					1																		
37			3				1																
38					1																		
39		1	4		1																		
40	18.144	1	1		1	1			1		1												
41		1	1		1	2	1		1														
42		1	5		1	3	2		1						1								
43		2	4	2	1	2	4	2	1		1												
44		2	4	3	4	1	7		4	1	1		1										
45	20.412	6	3	2	2	2	4		3	2	2												
46		1	2	1	2	3	3	3	3		4	1	3		2		1						
47		1	3	1	3	2	2	1	6	2	2	2		1					2				
48		1	1	1	4	1	3	3	4	2	7		2	2	1			1					
49		1	4	1	2	1	1	1	2	2	5		2	1	1	1	4	1	2				
50	22.680	2	1	2	3	4	4	2	3	3	5		5	1	2	1	3			1	1		
51		2	1	2	2	3	2	1	5	2	9	2	4	3	5	6		1			1		
52		1		3		1	4	1	4	2	6	1	5	2	6		3	2		1	2		
53		4		2	3	1	4	2	2	1	3	3	5	1	2	3	5		1	1	3	1	
54		2		1		1	3	3	1	2	2	1	2	3	2	4	4	1	4		1	1	
55	24.948	1				2	2	2	3	1	4	2	2	1	6	4	11	1	5		2	4	2
56		1		2		1		3	1	1	3	6	4	1	5	2	4	3	1	1	1	1	
57						2		2	2	3	5	2	4	8	6	3	4	4	1	1	5	1	4
58				1		2		3	1	3	2	3	2	2	8	2	5	3	1	3	2	2	3
59		1		1			1	3	1	1	2	1	3	4	5	2	8	1	4	2	4	2	5
60	27.252			2			1	1	1	1	2	1	4	3	2	2	3	1	2	4	6	1	4
61				1		1		1	1	1	1	2	1	2	4		4	2	7	1	4	8	2
62							1	1		2	1	1	3	3	4	5	3	2	4	2	1	2	5
63							1			1	2	1	1	2	3	2	2	3	1	2	3	1	5
64						1	1	1		2		2	2	1	9	5	3	4	6	2	2	3	9
65	29.484							2		1	2	2	1	2	1	4	4	1	1	4	2	4	9
66								1		3		4	2	5	3	4	3	2	5	2	2	2	5
67								1		1		1	1		1	4	3	3	1	1	1	3	3
68							1			1		2	1	1	1	2	3	2	6	4	5	1	4
69				1		1				1		1			1	6	2	3	2	4	2	2	3
70	31.752									1		3	1		2	3	2	2	2	1	4	3	3
71								1		2		2	3	1	1	1	6	4		1	2	4	3
72								1		1				1		1	1	5	4	3	1	2	4
73					1											1			1	1	1	4	4
74														1			1	4	2	1	5	6	2
75	34.020									1					1		1	5	2	4	2	1	2
76			1									1					1		1	2	2	6	5
77																		2	2	1	2	2	3
78												1				1			2	2	1	3	1
79								1							2		3		1	3		1	
80	36.287																1	1	1	2	3	2	3
81														1					3	1		1	2
82															1			1		2	1	3	3
83														1				1	1	1		2	1
84												1				1		2			1	2	1
85	38.562											1					2		1		2	2	1
86																			1			2	1
87																						3	2
88																					1		
89																		1	1	1		1	
90	40.823																			1		1	
91																							
92																							
93																							2
94																							1
95	43.091							1															2
96																							1
97																							
98																							
99																							

and age distribution.

Number of measurements—Boys, 1,475; girls, 2,103; total, 3,565.]

Age in years.																														B.	G.
11½		12		12½		13		13½		14		14½		15		15½		16		16½		17		17½		18			
B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.		
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	4
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	4
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	10
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	11
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	21
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12	14
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	20
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	18
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11	22
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	23
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16	27
...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22	31
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14	30
...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	29
1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	20
...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18	39
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22	19
1	2	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28	33
...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24	28
2	3	...	4	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	40
...	1	1	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18	28
2	1	...	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	28
2	6	4	4	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	27	32
3	1	1	3	2	3	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	27
8	5	...	1	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29	41
2	4	1	3	2	1	...	...	1	...	1	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	27	30
...	3	6	2	1	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30	28
3	5	2	4	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	21	20
1	2	2	2	4	5	1	3	1	...	...	2	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23	39
1	4	1	2	6	1	3	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30	18
2	1	2	4	4	3	1	2	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	23	24
2	5	4	2	1	2	...	...	1	2	1	2	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	26	28
...	2	3	5	4	5	2	...	1	2	1	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	26	25
3	4	3	5	5	2	4	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	19
1	1	6	4	1	1	2	1	3	2	2	3	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28	23
3	1	4	2	1	3	1	4	3	1	1	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	24	22
3	1	8	1	1	2	1	2	3	1	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	27	15
1	2	6	3	3	3	4	3	...	...	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	22	18
1	2	4	1	2	4	2	1	3	3	2	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22	17
2	4	2	3	3	4	4	4	3	1	2	1	3	1	1	...	...	1	2	...	...	...	...	...	...	...	...	...	27	25
3	4	2	3	4	3	3	1	1	1	1	1	2	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	21	22
1	1	5	1	1	1	3	3	3	...	2	1	1	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19	15
3	2	2	2	4	2	3	2	...	3	1	...	1	2	1	...	...	...	...	1	...	...	...	1	...	...	...	1	21	21
1	1	1	2	1	1	1	2	4	1	1	4	...	1	2	...	...	...	...	1	...	...	...	...	...	...	...	...	16	15
1	2	1	2	3	2	1	4	5	3	2	3	...	...	1	2	...	...	...	1	...	...	...	1	...	...	...	...	20	22
3	2	4	3	2	3	1	1	3	2	4	3	...	2	1	3	...	...	...	...	...	...	...	...	...	...	...	...	21	25
2	1	2	4	2	2	4	2	...	1	2	3	...	1	2	2	...	1	1	...	...	...	...	...	...	...	...	...	17	19
...	3	6	2	4	1	2	3	4	2	3	2	3	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	26	16
...	4	3	2	2	6	6	1	2	2	6	2	...	2	1	1	...	1	1	...	...	2	...	1	...	1	...	1	21	27
1	1	2	2	1	5	1	2	1	1	1	2	1	2	2	1	1	2	1	...	...	...	...	...	...	...	...	...	15	19
1	2	...	2	1	2	3	2	4	2	4	8	2	2	...	2	...	...	...	1	...	...	...	1	1	...	...	...	18	24
...	1	2	2	1	1	2	2	1	2	3	2	2	2	2	4	...	...	...	1	...	...	...	...	...	...	...	...	13	17
...	2	...	2	2	1	2	1	1	2	4	4	1	1	1	3	2	...	...	...	...	...	...	1	...	1	...	...	13	18
	2	2	1	1	2	1	4	4	2	3	1	2	1	1	4	...	...	...	...	...	...	...	...	...	1	...	...	15	20
		1	...	...	1	1	2	1	2	2	1	1	2	2	2	1	2	...	2	1	...	...	2	...	...	...	...	10	18
			1	...	2	2	2	1	1	3	2	1	1	1	4	...	1	1	...	...	...	...	1	...	1	...	...	11	22
			1	3	1	3	5	1	4	4	3	2	3	1	1	1	4	1	4	...	2	1	1	...	...	...	...	19	31
				1	2	...	2	1	1	2	8	1	4	1	1	1	...	1	2	1	1	...	1	...	...	...	1	10	24
					2	1	2	3	1	1	2	1	1	1	3	1	...	1	...	1	...	...	2	...	...	...	...	11	15
					1	1	4	1	2	6	3	3	4	2	2	1	2	1	1	...	...	1	...	...	2	...	...	20	24

TABLE 2.—*Weight and ag*

Weight.		Age in years.																					
		6		6½		7		7½		8		8½		9		9½		10		10½		11	
Pounds.	*Kilos.*	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
100	45.359																		1				
101																							
102															1								
103																							
104																							
105	47.627																						
106																							
107																							
108																							
109																		1					
110	49.895																						
111																							
112																							
113																							
114																							
115	52.167																						
116																							
117																1							
118																					1		
119																							
120	54.431																						
121																							
122																							
123																							
124																							
125	56.699																						
126																							
127																							
128																							
129																							
130	58.967																						
131																							
132																							
133																							
134																					1		
135	61.235																						
136																							
Number of cases		32	58	29	53	38	53	44	51	47	70	80	64	84	88	71	100	71	85	63	82	90	109
Median weight		47	44	51	47	50	48	50	49	57	51	60	56	59	58	63	59	67	65	69	66	71	67

distribution—Continued.

Age in years.																															
11½		12		12½		13		13½		14		14½		15		15½		16		16½		17		17½		18		B.	G.
B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.		
...	1	...	1	...	2	1	4	...	2	3	4	2	2	2	1	1	2	1	3	...	...	1	1	...	...	...	2	11	26
...	...	...	...	...	...	2	7	...	2	2	7	2	2	1	1	1	3	...	2	...	...	...	...	...	1	...	1	8	26
...	...	2	...	1	3	1	1	...	4	4	4	3	1	2	5	1	4	2	2	1	1	...	2	...	...	...	...	17	28
...	...	1	1	...	1	...	...	...	1	2	6	6	2	1	3	3	4	3	3	1	4	...	...	...	...	1	1	18	26
...	...	...	2	...	1	2	2	...	3	1	4	2	3	2	2	1	1	2	5	1	2	1	...	...	...	...	2	12	27
...	...	...	...	...	...	1	...	...	1	6	5	2	4	3	2	1	1	1	4	2	3	...	2	...	...	...	...	16	22
...	1	...	...	1	...	...	3	1	3	2	2	1	2	2	4	2	5	1	4	1	2	...	...	...	...	...	1	11	27
...	...	...	...	...	...	...	...	1	3	...	2	2	...	3	3	1	1	1	5	1	2	1	2	...	1	...	2	10	21
...	1	...	1	...	1	1	...	1	...	5	2	2	1	3	3	1	1	2	3	1	2	1	2	...	...	...	1	17	18
...	...	...	...	...	...	...	5	1	1	2	2	1	5	1	2	1	2	1	2	2	1	...	...	...	...	...	1	10	21
...	...	...	...	...	1	...	6	...	...	2	5	4	...	4	3	1	7	1	1	...	6	...	2	...	2	...	5	12	37
...	...	...	...	...	...	...	2	...	1	1	6	1	2	4	3	1	3	1	3	1	...	1	3	...	...	...	1	10	24
...	...	...	...	...	...	1	1	1	1	1	6	1	...	1	5	1	6	2	2	...	1	...	2	...	...	1	5	9	29
...	...	...	...	...	...	1	2	2	...	...	3	1	1	2	7	1	1	2	1	...	1	1	3	2	1	...	1	12	21
...	...	...	...	...	...	2	1	1	...	1	1	1	...	1	5	4	1	1	3	1	2	...	2	...	2	1	2	13	19
...	...	...	...	...	1	...	3	...	1	...	1	...	1	4	5	1	...	...	2	1	2	1	3	...	1	1	3	8	23
...	...	...	2	...	...	...	...	1	1	3	4	...	5	2	8	...	1	...	2	...	...	1	1	...	2	1	3	8	29
...	...	1	1	...	1	1	1	1	...	1	3	...	1	...	5	...	7	3	3	...	4	1	...	...	1	1	1	10	28
...	...	...	...	...	...	...	1	1	...	...	4	1	2	1	1	...	...	...	2	...	1	...	4	...	2	1	2	4	20
...	...	...	...	...	1	...	3	1	1	...	2	...	2	...	2	...	2	2	1	...	1	...	...	1	1	...	3	4	19
...	...	...	1	...	...	...	1	...	4	...	4	1	1	1	4	...	1	...	...	1	3	...	2	...	2	...	1	3	24
...	...	...	...	...	1	...	...	...	...	...	...	1	2	4	1	...	2	1	1	...	1	...	...	1	1	...	2	7	11
...	...	...	...	...	...	...	...	1	...	...	2	...	2	...	1	...	1	...	1	2	...	1	4	...	1	...	1	4	13
...	...	...	...	...	...	...	3	...	...	1	2	...	1	1	5	2	1	1	2	2	1	...	2	1	1	...	1	8	19
...	...	...	...	...	...	1	1	...	1	2	1	1	2	1	2	...	1	...	1	...	1	1	2	...	1	1	2	7	15
...	...	...	...	...	...	...	1	...	...	...	2	...	...	...	2	1	4	4	3	2	...	3	...	...	2	...	3	10	17
...	...	...	...	...	1	1	...	...	1	2	1	2	2	...	...	1	1	1	1	...	...	...	1	2	...	1	...	10	8
...	...	...	...	...	...	...	...	1	...	2	5	...	...	...	3	1	1	2	...	...	...	...	1	...	...	...	1	6	11
...	...	...	...	...	...	...	...	...	...	...	1	2	1	1	2	...	3	1	1	3	1	3	1	...	...	...	...	10	10
...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	2	1	1	1	...	...	...	1	1	1	1	...	...	5	6
...	...	...	...	...	...	...	1	...	...	...	1	...	3	2	2	1	1	...	2	...	...	1	1	1	...	...	3	5	14
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	2	...	2	2	...	...	...	1	1	4	6
...	...	...	1	...	1	...	...	...	...	...	...	1	...	1	2	...	...	...	1	...	1	1	1	...	...	...	2	3	9
...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	1	3	...	1	1	1	...	...	...	...	...	...	...	6	3
...	...	...	1	...	...	...	...	...	...	...	1	...	...	1	1	...	...	1	1	1	...	1	...	...	...	...	2	4	7
...	...	...	...	...	...	...	...	...	...	2	...	...	1	...	...	...	...	...	...	1	1	...	1	...	1	...	...	3	4
...	...	...	...	...	...	1	1	3	...	2	5	6	5	7	8	3	12	6	11	3	8	3	3	7	3	9	5	50	61
62	105	103	104	82	98	87	126	79	78	116	166	75	99	83	142	45	97	57	98	33	59	28	61	17	33	19	64	....	...
73	73	77	75	78	83	86	95	87	95	96	103	103	104	108	112	109	111	112	109	115	113	125	113	128	117	131	116	....	...

5. MEDIANS OF HEIGHT AND WEIGHT.

This table represents the median heights and median weights for boys and girls, for six-month intervals from 6 to 18 years of age, as derived from a study of the distribution of the two schools.

TABLE 3.—*Medians of height and weight.*

Age.	Median height.				Number of cases.		Median weight.				Number of cases.	
	Boys.		Girls.		Boys.	Girls.	Boys.		Girls.		Boys.	Girls.
	Centimeters.	*Inches.*	*Centimeters.*	*Inches.*			*Kilograms.*	*Pounds.*	*Kilograms.*	*Pounds.*		
6	116	45.7	114	45.1	23	41	21.3	47.0	19.6	43.6	32	38
6½	119	46.9	117	46.2	29	50	23.1	51.0	21.2	46.8	29	33
7	121	47.5	121	47.6	43	53	22.5	49.6	21.8	48.2	33	53
7½	125	49.2	123	48.4	47	54	25.5	56.2	22.2	49.0	43	51
8	128	50.3	125	49.2	52	87	25.9	57.2	23.2	51.3	47	72
8½	131	51.5	126	49.7	48	71	27.2	60.0	25.2	55.6	50	64
9	131	51.6	130	51.1	66	89	26.6	58.6	26.4	58.1	51	88
9½	134	52.7	131	51.5	73	101	28.4	62.5	26.9	59.3	71	100
10	136	53.5	135	53.0	73	93	30.5	67.2	29.7	65.5	71	83
10½	139	54.7	137	54.2	76	85	31.2	68.8	29.8	65.8	63	82
11	139	54.7	141	51.1	103	110	32.3	71.1	30.2	66.8	60	109
11½	142	55.9	144	56.6	61	96	33.0	72.7	32.9	72.5	62	105
12	145	57.1	146	57.4	112	123	34.8	76.8	34.2	75.3	103	104
12½	147	57.9	148	58.1	80	107	35.2	77.8	37.7	83.0	82	98
13	150	59.0	153	60.2	97	143	39.0	86.0	43.0	94.8	87	125
13½	152	59.8	155	60.9	68	115	39.5	87.0	43.1	95.0	79	78
14	155	60.9	157	61.8	123	185	43.6	96.1	46.5	102.6	116	165
14½	159	62.6	157	62.0	80	132	46.4	102.5	47.0	103.5	75	99
15	164	64.5	159	62.6	84	158	48.2	107.5	50.8	112.0	82	142
15½	164	64.7	159	62.6	55	97	49.1	108.5	50.2	111.2	75	97
16	167	65.7	160	62.9	52	109	50.8	112.0	49.4	108.8	57	98
16½	166	65.5	160	63.0	33	61	51.7	114.5	51.0	112.5	33	59
17	170	66.5	160	62.9	41	89	56.6	124.7	51.4	113.2	28	61
17½	170	66.5	161	63.4	25	36	58.2	128.5	52.8	116.5	17	33
18	170	66.5	162	63.8	28	77	59.1	130.5	51.4	115.7	19	64
	Total number of cases............				1,587	2,372	....	....	....	....	1,464	2,101
	Total number individuals........				501	706	....	....	....	....	460	638

6. INDIVIDUAL INCREMENTS IN HEIGHT, WEIGHT, AND LUNG CAPACITY.

The writer has aimed, as far as space will permit, to give the original data with results in such form that further comparisons and correlations may be worked out. Tables 4, 5, and 13–22 give the initial measurements in height, weight, and lung capacity, with the yearly increments and per cents of gain and loss for 50 boys and 50 girls from 7 to 13 years of age, and for 50 boys and 50 girls from 12 to 17 years of age. The individuals are arranged in an ascending scale in accordance with the initial height at 7 and 12 years of age. Many individuals with the longest series of measurements have been omitted on account of the records having been made before or after the interims included in these tables. All the individuals with long records, however, are represented in the charts of individual curves which follow the tables. The individuals represented in both tables may be found by means of the cross references given in the explanation of the curve charts.

In the tables the serial numerals at the left refer to the respective individuals. The heights are in centimeters, the weights in pounds, the lung capacities in cubic inches; the respective increments are of the same units of measurement. The per cent of gain is the proportion of the increment to the previous measurement. The averages and average deviations of increments and the averages of the per cents in the middle of the table are for the first 25 shorter individuals and those at the bottom of the table are for the 25 taller individuals. The average height, weight, and lung capacity for each year and half year at the bottom of the tables are for the 50 in each group and offer a means of comparison between the medians or norms found in the distribution tables where there were more individuals, but fewer repeated measurements. No measurements here, as indicated in the discussion on the method of procedure, can be more than three months from the exact chronological age.

These tables are given in order that the individual differences may be closely noted, that the differences between gain in absolute increment and gain in per cent may be compared, and that these data may be accessible for future comparisons in this study and for those who wish to make further correlations.

The boys and girls are from the three schools and represent a fairly normal distribution, except that the Francis W. Parker boys are slightly inferior to the others in height and the Francis W. Parker girls, who were measured more frequently than those of the other schools, show more individual fluctuations.

HEIGHT.

From the years 6 to 13½, the yearly increment varies from 1 to 8 or 9½ centimeters. At the age of 12 there is a surprising jump in the increase, which reaches as high as 12 centimeters; the rapid increase continues up to 17 years of age. The increase from 6 to about 7½ has no uniformity, and seems to depend on the individual. From the years 8 to 12 the usual increase is from 7 to 9 centimeters. Here, too, is the greatest uniformity of increase, that is more boys increase the same number of centimeters than at any other time. In some sporadic cases the increment is as much as 10 centimeters. From 13 to 17 the increment is larger.

WEIGHT.

From the years 6 to 7½ there is little uniformity in weight increment, for it varies all the way from 2 to 15 kilograms. At 7½ the increase begins to be a little more uniform, and a rough average can be taken. This is about 4 kilograms. In two cases there was a loss, of 2 and of 5 kilograms, respectively; but loss is rare. The average stays almost the same up to 13 years. But some individuals increased from 14 to 22 kilograms. These cases, were, however, sporadic. The greatest uniformity occurs from 9½ to 10½ and again from 14 to 15½. The least uniformity of increase is from 12 to 13. The average increment in the ages between 11 and 17 is from 6 to 10 kilograms. The greatest increase, 18 to 23 kilograms, is found to occur between the ages of 12 and 16½. In one case between 16 and 17 the increase was remarkable, 35 kilograms. There were four cases of loss varying from 1 to 4 kilograms. The increase from 11 to 17 is so irregular as to make it almost impossible to strike an average.

LUNG CAPACITY.

As a rule, the greatest relative gains in breathing capacity occur between the first and the second measurement, which is probably due to the fact that the child has not learned how to use the spirometer, which involves a voluntary reaction as well as a physical measurement. The cases where children lose in breathing capacity are, as a rule, near the first measurements or are caused by colds at the time of measurement.

There is less uniformity in lung capacity than there is in weight. For example, between the ages of 7½ and 8½ the increment varies from a loss of 16 cubic centimeters to an increase of 49. Before the age of 7½ there is absolutely no uniformity; after this the average may be roughly estimated at 8 to 16 cubic centimeters increase. In the ages from 10 to 13 there is a great fluctuation; all the way from 2 to 22 cubic centimeters, and 2 cases of loss. Uniformity is almost lost from 11 to 17. The ages of greatest uniformity are from 13 to 15.

To give a few examples of the extreme fluctuation, and to give an idea of the difficulty in striking even a rough average, the following cases may be cited: From 11 to 12 years of age the lung capacity varies from a loss of 2 to a gain of 46 cubic centimeters; from 13 to 14 it varies from a loss of 16 to a gain of 56 cubic centimeters; from 14 to 15, from a gain of 2 to a gain of 66 cubic centimeters; from 16 to 17, from a loss of 2 to a gain of 56 cubic centimeters.

It is to be noted in reading these tables that the initial height, weight, and lung capacity are given in the first column after the individual's number. The yearly increment or gain in growth is given just after the initial measurement and the gain per cent just after the increment. For example, number 1 was 112 centimeters tall at 7 years of age and 116.8 centimeters at 8 years of age. This girl grew 4.8 centimeters, or 4.3 per cent, during the year. At 9 years of age this girl was 119.6 centimeters tall, and she had, therefore, gained 2.8 centimeters, or 2.4 per cent.

TABLE 4.—*Increments of growth in height for a group of*

No.	7 years.			7½ years.			8 years.			8½ years.			9 years.			9½ years.			10 years.		
	Height.	Increment, 6-7 years.	Per cent gain.	Height.	Increment, 6½–7½ years.	Per cent gain.	Height.	Increment, 7-8 years.	Per cent gain.	Height.	Increment, 7½–8½ years.	Per cent gain.	Height.	Increment, 8-9 years.	Per cent gain.	Height.	Increment, 8½–9½ years.	Per cent gain.	Height.	Increment, 9-10 years.	Per cent gain.
	Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*	
1	112.0						116.8	4.8	4.3				119.6	2.8	2.4	121.3			124.6	5.0	4.
2	112.8						118.8	6.0	5.3				123.6	4.8	4.0				129.6	6.0	4.
3	113.0						118.6	5.6	5.0				123.2	4.6	3.9				126.0	2.8	2.
4				113.1						119.0	5.9	5.2	122.6						127.2	4.6	3.
5				113.7									119.8			123.4					
6	114.3	4.9	4.5	116.6	5.6	5.1				121.9	5.3	4.5	123.3			125.6	3.7	3.1			
7				114.8						119.6	4.8	4.2				122.4	2.8	2.3			
8				116.0						121.0	5.0	4.3				126.6	5.6	4.6			
9				117.2						123.4	6.2	5.2				129.0	5.6	4.5			
10	116.0						120.0	4.0	3.4				125.2	5.2	4.3				130.0	4.8	3.
11				120.0						125.6	5.6	4.7				131.0	5.4	4.3			
12	117.4			123.0	6.2	5.6				128.0	5.0	4.1				131.8	3.8	2.9			
13				117.7			120.2			122.1	4.4	3.7	126.0	5.8	4.8	128.0	5.9	4.9			
14	117.9			122.1			123.6	5.7	4.8				129.3	5.7	4.6						
15				118.4	4.1	3.6	121.2			123.6	5.2	4.4	126.5	5.3	4.4	128.6	5.0	4.1	133.2	6.7	5.
16	118.4	6.4	5.7				125.6	7.2	6.1				129.8	4.2	3.3				136.0	6.2	4.
17	118.6						122.6	4.0	3.3				128.4	5.8	4.7				134.4	6.0	4.
18				118.8	6.6	5.9				124.4	5.6	4.7				129.0	4.6	3.7			
19	119.0			122.5									128.9			130.7			133.9	5.0	3.
20	119.2									124.4						129.6	5.2	4.1			
21	119.4						125.0	5.6	4.7	125.9						130.7	4.6	3.6	133.9		
22				119.6			122.2						127.0	4.8	3.9				131.4	4.4	3.
23				119.6	4.6	4.0				122.6	3.0	2.5				126.4	3.8	3.1	129.8		
24				120.0			123.6						127.8	4.2	3.5				131.6	3.8	3.0
25	121.0	6.0	5.2				124.4	3.4	2.8				129.4	5.0	4.0				133.8	4.4	3.4
Av.		5.8	5.1		5.4	4.8		5.1	4.4		5.1	4.6		4.9	3.9		4.7	3.8		5.0	3.9
Av. var.		.6			.9			1.0			.6			.6			.7			.8	
26	116.2	5.8	5.3				122.4	6.2	5.3				127.0	4.6	3.8				133.0	6.0	4.7
27				118.3			120.3			123.9	5.6	4.7	126.7	6.4	5.3	129.2	5.3	4.3			
28	120.5			123.5			126.3	5.8	4.8				128.9	2.6	2.1	131.4			134.2	5.3	4.1
29				121.0						125.2	4.2	3.5				129.8	4.6	3.7	134.8		
30	121.0						126.4	5.4	4.5				130.4	4.0	3.2				136.6	6.2	4.7
31				122.6	5.4	4.6				128.2	5.6	4.6				134.4	6.2	4.8			
32	122.2						125.4	3.2	2.6				127.7	2.3	1.8	130.7					
33				122.2	4.2	3.6				126.4	4.2	3.4				132.4	6.0	4.7			
34	123.4						130.0	6.6	5.3	133.8						138.0	4.2	3.1			
35				123.6			128.6						134.0	5.4	4.2				139.0	5.0	3.
36				123.4	3.5	2.9	125.6			128.4	5.0	4.1				136.1	7.7	6.0	137.9		
37				124.6			128.6						134.6	6.0	4.7				140.4	5.8	4.
38				124.6	6.2	5.2				130.6	6.0	4.8				135.4	4.8	3.7			
39				124.8						130.0	5.2	4.2				137.2	7.2	5.5			
40	125.0	6.0	5.0				129.6	4.6	3.7				135.0	5.4	4.2				139.2	4.2	3.1
41	127.5			129.3						136.5	7.2	5.6	138.3	5.5	4.1				141.6	3.3	2.
42				127.0						133.6	6.6	5.2				140.0	6.4	4.8			
43				131.0			133.2	6.2	4.9				136.5	3.3	2.5				139.7	3.2	2.
44				127.0			129.1			132.2	5.2	4.1	137.0	7.9	6.1				142.3	5.3	4.
45				127.2	5.0	4.1				133.6	6.4	5.0				138.6	5.0	3.7			
46				128.4	5.0	4.1				132.8	4.4	3.4				138.4	5.6	4.2			
47				128.0						133.6	5.6	4.4				138.8	5.2	3.9			
48				128.5	4.7	3.8	132.0			134.6	6.1	4.7	137.2	5.2	3.9	139.3	4.7	3.5			
49	129.8						136.4	6.6	5.1				142.8	6.4	4.7				149.6	6.8	4.8
50	135.9			137.1	4.3	3.2	141.9	6.0	4.4	146.2	9.1	6.6	148.7	6.8	4.8	152.7	6.5	4.4	156.1	7.4	5.0
Av.	120	5.9	5.2	122.6	4.8	3.9	125.4	5.6	4.5	128.0	5.8	4.6	129.8	5.1	4.0	132.1	5.7	4.3	135.5	5.3	3.9
Av. var.		.1			.6			.8			.9			1.3			.9			1.0	

girls from 7 to 13 years of age with consecutive measurements.

10½ years.			11 years.			11½ years.			12 years.			12½ years.			13 years.			
Height.	Increment, 9½–10½ years.	Per cent gain.	Height.	Increment, 10–11 years.	Per cent gain.	Height.	Increment, 10½–11½ years.	Per cent gain.	Height.	Increment, 11–12 years.	Per cent gain.	Height.	Increment, 11½–12½ years.	Per cent gain.	Height.	Increment, 12–13 years.	Per cent gain.	No.
Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		
126.3	5.0	4.1				130.7	4.4	3.5	135.2			137.4	6.7	5.1	142.5	7.3	5.4	1.
			134.0	4.4	3.4				142.6	8.6	6.4				148.2	5.6	3.9	2.
			130.6	4.6	3.7				136.6	6.0	4.6				142.0	5.4	4.0	3.
			130.7	3.5	2.8				134.6	3.9	3.0				140.6	6.0	4.5	4.
128.0	4.6	3.7				133.0	5.0	3.9				138.4	5.4	4.1				5.
129.0	3.4	2.7							139.5						143.4	3.9	2.8	6.
126.0	3.6	2.9				130.6	4.6	3.7										7.
132.4	5.8	4.6				142.0	9.6	7.2				147.4	5.4	3.8				8.
134.6	5.6	4.3				138.6	4.0	3.0				143.6	5.0	3.6				9.
			135.8	5.8	4.5				140.8	5.0	3.7				148.1	7.3	5.2	10.
135.8	4.8	3.7				140.0	4.2	3.1				144.2	4.2	3.0				11.
						141.6												12.
132.7	4.7	3.7	134.6			136.0	3.3	2.5	140.3	5.7	4.2	143.4	7.4	5.4	148.6	8.3	5.9	13.
134.0			138.8						143.2	4.4	3.2				151.2	8.0	5.6	14.
			137.4	4.2	3.2	139.7			143.0	5.6	4.1	146.9	7.2	5.2	152.4	9.4	6.6	15.
			141.4	6.4	4.7				147.0	5.6	4.0				153.6	6.6	4.5	16.
			139.0	4.6	3.4				145.4	6.4	4.6							17.
133.6	4.6	3.6				139.6	6.0	4.5				145.0	5.4	3.9				18.
136.5	5.8	4.4	138.0	4.1	3.1				144.1	6.1	4.4	151.0			152.4	8.3	5.8	19.
136.6	7.0	5.4	144.0						151.2	7.2	5.0				154.4	3.2	2.1	20.
136.5	5.8	4.4	138.9	5.0	3.7	140.9	4.4	3.2	147.5	8.6	6.2	149.8	8.9	6.3				21.
			135.4	4.0	3.0				141.6	6.2	4.6				148.8	7.2	5.1	22.
			137.0	7.2	5.5				143.5	6.5	4.8				150.2	6.7	4.1	23.
			136.6	5.0	3.8				142.0	5.4	4.0				148.0	6.0	4.2	24.
			138.8	5.0	3.7	141.6			144.6	5.8	4.2				150.4	5.8	4.0	25.
	5.1	4.0		5.0	3.7		5.1	3.9		6.1	4.4		6.2	4.5		6.6	4.6	Av.
	.8			.8			1.2			.9			1.2			1.2		Av. var.
			138.8	5.8	4.4				147.2	8.4	6.1				153.2	6.0	4.1	26.
134.2	5.0	3.9	136.2									142.3			144.4			27.
137.0	5.6	4.3	138.4	4.2	3.1				147.3	8.9	6.4	151.7			154.9	6.6	4.5	28.
			142.0	7.2	5.3				148.8	6.8	4.9				157.0	8.2	5.5	29.
			140.8	4.2	3.1				147.0	6.2	4.4	151.6						30.
139.0	4.6	3.4				145.0	6.0	4.3				149.1	4.1	2.8				31.
139.7	9.0	6.9	141.5						151.3	9.8	6.9	151.7						32.
138.0	5.6	4.3				143.8	5.8	4.2				152.0	7.2	5.0				33.
141.2	3.2	2.3				146.2	5.0	3.5	157.2	7.9	5.3	152.4	6.2	4.2				34.
			143.0	4.0	2.9				147.7	4.7	3.3				151.2	3.5	2.4	35.
			143.5	5.6	4.1	146.1						153.0	6.9	4.7	155.5			36.
			145.0	4.6	3.3				150.6	5.6	3.9				155.2	4.6	3.1	37.
141.4	6.0	4.4				148.4	7.0	4.9				158.0	9.6	6.5				38.
143.8	6.6	4.8										154.8						39.
			144.8	5.6	4.0				148.4	3.6	2.5				154.6	6.2	4.2	40.
145.3			149.3	7.7	5.4	153.0	7.7	5.3	156.0	6.7	4.5				162.8	6.3	4.3	41.
145.6	5.6	4.0				152.0	6.4	4.4				158.4	6.4	4.2				42.
			144.6	4.9	3.5				151.0	6.4	4.4	152.7						43.
			149.3	7.0	4.9	153.9						159.5	5.6	3.6				44.
144.4	5.8	4.2				150.4	6.0	4.2				155.9	5.5	3.7				45.
144.2	5.8	4.2				151.6	7.4	5.1				156.4	4.8	3.2				46.
146.2	7.4	5.3				153.8	7.6	5.2				161.0	7.2	4.7				47.
143.4	4.1	2.9	146.6			148.5	5.1	3.6	151.7	5.1	3.5	161.2	12.7	8.6				48.
			154.4	4.8	3.2				160.2	5.8	3.8				167.0	6.8	4.2	49.
						168.1			170.4									50.
137.3	5.7	4.2	140.3	5.5	3.9	144.6	6.4	4.5	146.8	6.6	4.6	150.7	6.9	4.7	151.1	6.1	4.0	Av.
	1.0			1.0			.8			1.4			1.6			1.0		Av. var.

TABLE 5.—*Increments of growth in height for a group of*

No.	12 years.			12½ years.			13 years.			13½ years.			14 years.			14½ years.		
	Height.	Increment, 11–12 years.	Per cent gain.	Height.	Increment, 11½–12½ years.	Per cent gain.	Height.	Increment, 12–13 years.	Per cent gain.	Height.	Increment, 12½–13½ years.	Per cent gain.	Height.	Increment, 13–14 years.	Per cent gain.	Height.	Increment, 13½–14½ years.	Per cent gain.
	Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*	
51	128.0			134.0						139.4	5.4	4.0				145.2	5.8	4.2
52	132.8	5.2	4.1				140.8	8.0	6.0				144.4	3.6	2.6			
53				134.6						139.8	5.2	3.9				149.0	9.2	6.6
54				134.4	2.4	1.8	137.0						144.0	7.0	5.1			
55				136.0	3.0	2.3	139.0						144.2	5.2	3.[illegible]			
56	137.2	3.0	2.2	140.2						146.4	6.2	4.4				152.2	5.8	3.9
57	137.8	3.8	2.8	144.0	8.5	6.3	146.9	9.1	6.6				147.9	1.0	.7	153.0		
58				138.2	6.4	4.9				145.6	7.4	5.4				150.4	4.8	3.3
59	138.6	7.6	5.8				144.8	6.2	4.5				148.4	3.6	2.5			
60	138.8	6.6	4.9				143.8	5.0	3.6	149.0						153.6	4.6	3.2
61	139.0	4.2	3.1				143.0	4.0	2.9				148.0	5.0	3.5			
62	139.4	6.0	4.5	140.8	5.0	3.7				147.3	6.5	4.6	151.8					
63	139.7						143.4	3.7	2.6	147.3			148.5	5.1	3.6	152.1	4.8	3.3
64	140.3	8.3	6.3				146.0	5.7	4.1	149.8			151.2	5.2	3.6	155.0	5.2	3.5
65				141.0	5.6	4.1	145.4						152.0	6.6	4.5			
66	141.4	5.7	4.2				149.2	7.8	5.5	154.3			157.7	8.5	5.7	158.7	4.4	2.8
67	142.0	9.0	6.8	144.9						147.6	2.7	1.9	148.0					
68	143.2	4.4	3.2	146.8						153.4	6.6	4.5				160.0	6.6	4.3
69	143.2									151.8						157.6	5.8	3.8
70				143.4	5.4	3.9				150.4	7.0	4.9				154.6	4.2	2.8
71	144.4						149.2	4.8	3.3				151.1	1.9	1.3			
72	145.4	4.2	3.0				150.8	5.4	3.7				155.8	5.0	3.3			
73	145.8	6.2	4.4				148.4	2.6	1.8				150.6	2.2	1.5			
74				147.0	4.8	3.4				149.0	2.0	1.4				151.0	2.0	1.3
75	147.6	9.6	7.0				153.6	6.0	4.1				156.4	2.8	1.8			
Av.		6.0	4.5		5.1	3.8		5.7	4.1		5.4	3.9		4.5	3.1		5.3	3.6
Av. var.		1.6			1.3			1.4			1.4			1.5			1.2	
76	143.0						151.4	8.4	5.9				159.4	8.0	5.3			
77	145.4	3.8	2.7				152.0	6.6	4.5				157.4	5.4	3.6			
78	146.2	7.4	5.3				153.6	7.4	5.1	158.6						165.1	6.5	4.1
79				146.6	6.2	4.4				153.4	6.8	4.6				160.1	6.7	4.3
80				146.5	8.0	5.8				148.3	1.8	1.2	152.0			154.4	6.1	4.1
81	147.2						150.8	3.6	2.4				158.0	7.2	4.8			
82	147.3	7.3	7.3				151.0	3.7	2.6	154.3			159.0	8.0	5.3	163.0	8.7	5.6
83	147.8	5.6	3.9				155.2	7.4	5.0	157.6			159.4	4.2	2.7			
84	148.4						154.0	5.6	3.8				156.0	2.0	1.3			
85	148.7			152.4	6.9	4.7	155.5	6.8	4.6				160.7	5.2	3.3	162.1		
86	149.2	5.2	3.6				157.4	8.2	5.5				162.0	4.6	2.9			
87				149.8	5.4	3.7	154.8						162.2	7.4	4.[illegible]			
88	150.4			154.1	10.0	6.9	158.2	7.8	5.2				162.2	4.0	2.5	162.9		
89	151.7	3.2	2.2				160.0	8.3	5.5							166.3		
90				151.4	9.0	6.3				156.6	5.2	3.4				159.0	2.4	1.5
91				154.9						160.0	5.1	3.3	163.7			164.7	4.7	2.9
92	155.8	11.5	7.9				161.0	5.2	3.3				163.0	2.0	1.2	164.6		
93	156.2			157.7			159.2	3.0	2.9	162.0	4.3	2.7	162.4	3.2	2.0			
94				157.0	10.9	7.5				160.6	3.6	2.3	162.2					
95	156.6	7.0	4.6				163.8	7.2	4.6				167.6	3.8	1.[illegible]			
96	158.0	8.0	5.3				158.7	.7	.4	161.2			162.0	3.3	2.1	162.2	1.0	.6
97	159.0						164.8	5.8	3.6				167.0	2.2	1.3			
98				161.0	7.0	4.5				167.8	6.8	4.2				169.4	1.8	1.0
99				163.6	5.6	3.5				167.0	3.4	2.1				168.0	1.0	.6
100				164.2	8.2	5.3				169.0	4.8	2.9				170.6	1.6	.9
Av.	145.2	6.6	4.7	147.4	7.7	5.3	151.3	6.0	4.1	153.9	4.6	3.0	155.9	4.7	3.0	158.7	4.2	2.6
Av. var.		1.9			1.5			1.8			1.2			1.7			2.5	

50 girls from 12 to 17 years of age with consecutive measurements.

15 years.			15½ years.			16 years.			16½ years.			17 years.			
Height.	Increment, 14–15 years.	Per cent gain.	Height.	Increment, 14½–15 years.	Per cent gain.	Height.	Increment, 15–16 years.	Per cent gain.	Height.	Increment, 15½–16½ years.	Per cent gain.	Height.	Increment, 16–17 years.	Per cent gain.	No.
Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		
			148.0	3.0	2.1	150.0			150.0	2.0	1.4				51.
150.0	5.6	3.9				150.8	0.8	0.5				150.8	0.0	0.0	52.
			154.0	6.0	4.0										53.
147.8	3.8	2.6				150.4	2.6	1.8				151.1			54.
150.6	6.4	4.4				154.1	3.5	2.3				156.4	2.3	1.5	55.
			157.0	4.8	3.2				159.8	2.8	1.8				56.
154.0	6.1	4.1	156.7	3.7	2.4	157.7	3.7	2.4				160.0	2.3	1.5	57.
			153.2	2.8	1.9				153.2	.0	.0				58.
149.2	.8	.5				151.4	2.2	1.5				151.6	.2	.1	59.
			155.0	1.4	.9				156.6	1.6	1.0				60.
152.0	4.0	2.7				153.8	1.8	1.2							61.
155.2	3.4	2.2	157.1						158.7	1.6	1.0	158.7			62.
152.1	3.6	2.4				152.0	− .1	− .7	153.4						63.
155.0	3.8	2.5				158.7	3.7	2.4	158.7			158.7		.0	64.
156.0	4.0	2.6				158.0	2.0	1.3				159.0	1.0	.6	65.
159.6	1.9	1.2	161.4	2.7	1.7	161.5	1.9	1.2	161.6	.2	.1	161.6	.1		66.
			149.1						151.0	1.9	1.3				67.
			163.2	3.2	2.0				163.8	.6	.4				68.
161.0						160.6	− .4	− .3				166.0	5.4	3.4	69.
			156.6	2.0	1.3				156.2	− .4	− .3				70.
155.0	3.9	2.6				155.0		.0				154.5	− .5	− .3	71.
159.0	3.2	2.1				159.8	.8	.5				160.4	.6	.4	72.
152,1	1.5	1.0				152.3	.2	.1				152.3	.0	.0	73.
			151.6	.6	.4				152.2	.6	.4				74.
156.6	.2	.1				158.4	1.8	1.2				158.4	.0	.0	75.
	3.5	2.3		3.0	2.0		1.6	1.0		1.1	.7		1.0	.7	
	1.3			1.1			1.1			.9			1.3		
163.0	3.6	2.3				165.0	2.0	1.2				167.0	2.0	1.2	76.
163.0	5.6	3.6										166.0			77.
167.0			169.2	4.1	2.5	170.0	3.0	1.8	170.0	.8	.5				78.
			163.8	3.8	2.4				164.8	1.0	.6				79.
			162.5	8.1	5.2				166.3	3.8	2.3				80.
163.2	5.2	3.3	164.0			164.4	1.2	.7				164.8	.4	.2	81.
164.2	5.2	3.3				166.3	2.1	1.3	166.3			167.0	.7	.4	82.
162.6	3.2	2.0				164.6	2.0	1.2				164.6	.0	.0	83.
158.6	2.6	1.7				159.4	.8	.5				159.6	.2	.1	84.
163.0	2.3	1.4							164.4						85.
166.0	4.0	2.5				167.0	1.0	.6				168.0	1.0	.6	86.
164.4	2.2	1.4				169.2	4.8	2.9				170.8	1.6	.9	87.
163.4	1.2	1.7	165.0	2.1	1.3				165.4	.4	.2	166.0			88.
167.6						168.8	1.2	.7				170.1	1.3	.8	89.
			160.3	1.3	.8				160.3	.0	.0				90.
165.8	2.1	1.3	166.5	1.8	1.1				167.6	1.1	.7	167.7			91.
						166.2			167.0						92.
						163.0			163.5						93.
162.8	.6	.4							162.8			163.8			94.
169.6	2.0	1.2	170.4						170.8	.4	.2				95.
162.5	.5	.3	162.5	.3	.2	162.5	.0	.0	162.5	.0	.0	163.7	1.2	.7	96.
170.4	3.4	2.0				170.6	.2	.1				170.6	.0	.0	97.
			170.8	1.4	.8				171.0	.2	.1				98.
			168.0	.0	.0				168.0	.0	.0				99.
			171.4	.8	.5				171.4	.0	.0				100.
159.0	2.9	1.8	160.7	2.4	1.5	160.0	1.7	1.0	161.8	.7	.4	161.1	.8	.5	
	1.3			1.5			1.0			.7			.6		

7. AVERAGE INCREMENTS IN HEIGHT, WEIGHT, AND LUNG CAPACITY.

A study of the individual measurements in height reveals different correlations in growth for boys and girls above the median (average) from those below. That is, the rhythms of fluctuations of growth for tall children differ materially from those for short children. This is demonstrated by the norms found, which serve in this connection as a temporary expedient for estimating the relative heights of this group of children and as a means for dividing them into two general groups, those lying on and above the median and those lying below the median. There are some who cross the median, and others whose curves fluctuate toward or from the median. Those lying above the median height begin and end their periods of acceleration and arrest earlier than those below the median. The increment tables following give the averages and average variations in yearly and half-yearly increments for boys and for girls in height and weight in the two Chicago schools and in the Horace Mann School.

As will be noted, the results give the greatest absolute increment and the greatest average deviations during the adolescent period, beginning at 12 years of age for boys above the median height and beginning at 10½ years for the girls above the median. This marked acceleration continues until 15½ for boys and until 13 for girls. For those below the median height the greatest average acceleration begins at 14 years for boys, and at 11½ years for girls, and continues, for the boys, until 17½ and for the girls until 15½. The tables also show there is a period of slightly more marked acceleration or arrest from 6 to 8 years of age, depending on the relative height and the median. There then follows a gradual decrease in absolute and relative increment until the advent of the pubescent increase. The results hold for each school separately and for the groups collectively, for boys and for girls.

No individuals were eliminated whose measurements and ages were found to be accurate, but as stated above there were some whose first measurements were below the median and whose last measurements were above the median; these were grouped with those above the median. There were a few others whose first measurements were above the median and whose last measurements were below the median; these were grouped with those below the median. The fluctuations in the growth of these latter children tend to obliterate the characteristics of the two main groups, i. e., they tend to destroy rather than accentuate the most common pubescent tendencies of each group. It did not, however, seem best to form a separate division of these "crosses," since it would be impossib[illegible] draw a distinct line of demarcation between those above a[illegible] below the median.

The rhythms and fluctuations of growth in height for the children above the median show that these boys and girls mature in physiloogical growth earlier than those below the median, since their periods of acceleration and arrest begin earlier and end earlier. There are individual measurements lying on either side of these medians, arranged in all probability in a normal distribution from the tallest to the shortest for each chronological age. If this is the case, as the individual curves will show, we are justified in making averages or medians only when the average or norm is based on the physiological age instead of the chronological age. A new and very important educational problem is evoked here: How may we formulate a measuring scale for determining the physiological age of the child? A careful study of individual growth curves, based on consecutive measurements, it is hoped, will help to answer this question.

These significant characteristics of tall and short children, differing in their periods of acceleration and arrest, may also be noted in the groups of 200 individuals whose heights and increments are given in Tables 4, 5, and 13 to 22.

TABLE 6.—*Averages and average deviations of height and weight increments of boys and girls, from the University of Chicago schools and the Francis W. Parker School.*

Ages.	Boys.								Girls.							
	Height.				Weight.				Height.				Weight.			
	Above median.		Below median.		Above median.		Below median.		Above median.		Below median.		Above median.		Below median.	
	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.
	Cm.	*Cm.*	*Cm.*	*Cm.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
6 – 6½	4.4	0.3	4.1	0.5	....	....	....	....	2.9	0.2	1.6	0.4	3.1	1.0	2.4	....
6½ – 7	....	....	3.1	1.1	....	....	2.3	1.9	2.9	.4	3.6	.6	3.1	1.4	3.8	0.4
6 – 7	6.4	1.4	4.7	.8	....	....	2.0	2.4	4.7	.4	5.7	.4	3.2	1.7	5.4	.4
7 – 7½	4.3	.6	3.5	.7	5.8	3.4	1.4	1.1	2.6	1.0	2.3	.0	1.0	.7	2.7	.5
½– 7½	6.0	1.8	4.4	1.5	8.5	1.9	3.6	2.2	5.2	1.2	5.2	.5	5.0	1.0	4.0	.3
– 8	3.1	.7	3.0	1.0	6.8	4.4	3.5	.9	2.6	.9	2.1	.5	3.1	1.9	1.5	.0
8	6.4	1.0	5.5	.8	9.2	2.1	5.2	1.2	4.9	.9	5.2	1.2	3.4	2.5	4.4	1.9
[illegible]	2.9	.8	2.0	.5	4.5	2.7	1.8	1.6	2.7	.7	2.9	.9	3.4	1.2	1.9	.7
[illegible]	5.7	.8	5.3	.9	5.6	4.0	7.4	2.5	5.5	1.1	5.2	.9	5.1	2.5	6.6	2.5
[illegible]	2.9	.9	2.2	1.2	3.9	2.3	1.9	1.9	3.1	.8	2.5	.6	3.4	2.6	2.6	4.4
[illegible]	5.3	1.3	4.6	1.1	4.9	2.1	4.8	1.3	5.1	1.3	5.0	.8	7.6	2.8	5.9	1.7
[illegible]	3.3	.8	3.3	.9	2.3	1.4	2.4	1.5	2.6	.9	2.9	.8	4.5	2.5	2.2	2.3
[illegible]	5.4	1.3	5.0	.5	5.1	4.5	5.6	2.3	5.3	.8	5.0	1.2	9.2	7.6	5.0	1.4
[illegible]	2.2	1.1	2.9	.8	3.8	1.2	4.8	1.9	3.0	.7	3.1	1.0	3.9	1.7	2.3	2.7
[illegible]	5.4	.7	4.4	.7	5.6	1.7	4.7	2.0	5.2	1.1	4.7	1.6	6.5	2.4	4.6	1.5
[illegible]	2.8	.8	3.9	1.4	3.3	1.2	3.4	1.3	3.4	1.0	2.6	.7	5.6	2.9	4.2	3.6
[illegible]	4.6	1.4	4.2	.9	4.8	2.1	4.3	1.9	5.9	1.3	4.7	1.1	8.0	4.4	6.2	1.7
[illegible]	2.3	.7	2.4	1.2	2.7	1.7	3.2	.8	2.7	1.0	3.2	1.5	3.6	2.7	2.7	1.8
[illegible]	4.6	.9	4.2	1.3	4.8	2.7	2.9	1.8	5.3	1.7	5.9	1.3	7.3	3.8	6.6	4.4
[illegible]	2.6	1.7	2.0	.7	2.9	3.6	3.1	.8	3.6	1.3	1.9	.6	5.1	2.1	3.9	1.3
[illegible]	4.9	1.0	5.4	1.2	8.5	2.8	5.9	2.1	7.4	1.9	4.3	.9	9.2	3.9	6.0	2.5
[illegible]	3.3	.8	2.8	1.8	6.3	4.3	5.1	3.3	3.7	1.4	3.2	.9	6.9	3.5	4.1	2.4
[illegible]	5.2	1.4	4.6	1.3	8.6	3.3	6.0	1.9	7.0	1.7	5.3	1.1	10.9	4.6	7.1	3.1
[illegible]	3.4	1.3	2.4	.3	4.1	1.7	2.7	1.5	4.1	1.2	3.0	1.0	8.8	4.1	5.9	2.4
[illegible]	5.2	1.6	5.0	1.6	9.6	5.0	6.5	3.7	7.5	1.7	6.2	1.5	15.2	5.5	9.1	3.5
[illegible]	4.1	1.0	2.0	.9	6.0	2.4	3.8	1.7	3.3	1.4	4.0	1.7	4.9	3.4	7.1	2.6
[illegible]	6.2	2.0	4.6	1.3	10.0	4.8	5.8	2.9	6.6	1.4	6.2	2.4	11.7	4.0	9.6	3.1
[illegible]	4.0	1.8	2.8	1.3	10.4	5.1	4.5	3.4	2.6	1.0	3.6	.7	6.3	4.2	4.9	2.0
[illegible]	6.3	2.3	5.4	1.5	9.7	4.0	9.9	4.2	5.2	1.2	6.1	2.0	11.8	4.8	10.2	3.0
[illegible]	3.0	.3	4.0	1.5	5.0	2.8	6.7	3.0	2.0	1.2	2.7	1.2	4.7	3.7	3.9	3.1
[illegible]	5.4	2.0	5.3	1.5	10.6	5.1	8.8	5.3	4.0	1.4	5.7	1.7	10.4	5.4	11.1	5.1
[illegible]	5.2	1.2	3.9	1.2	7.2	4.6	6.0	3.8	1.5	.3	2.9	.9	5.4	6.3	6.5	4.0
[illegible]	6.3	1.7	5.3	1.5	13.0	3.1	14.0	3.3	4.1	1.5	6.3	2.1	11.5	3.5	11.9	6.1
[illegible]	4.2	1.5	3.6	.9	11.1	1.4	9.2	1.1	1.1	.9	1.2	1.0	3.5	2.8	6.7	4.3
[illegible]	7.6	1.3	8.3	.7	16.9	.5	12.5	3.8	2.5	.9	3.9	1.6	9.2	4.3	11.7	4.7
[illegible]	3.4	1.0	3.6	1.0	14.0	6.0	8.4	1.5	1.2	1.1	1.3	.9	2.8	2.7	1.7	4.3
[illegible]	6.1	2.3	7.2	1.3	14.9	2.6	15.2	3.2	2.8	1.2	3.1	1.8	5.3	2.4	8.1	2.1

2.1	.4	3.6	1.4	1.5	.6	8.5	2.7	.4	.4	.5	.6	1.5	4.4	1.1	2.1
4.9	.1	6.8	2.0	17.2	7.4	11.6	6.8	1.8	1.5	1.2	.7	4.6	2.3	4.9	3.1
1.5	1.2	2.8	1.4	6.0	1.0	9.5	3.2	.4	.4	.6	.6	.7	3.1	1.8	3.2
2.2	2.1	5.8	2.2	13.2	4.4	13.6	5.9	1.4	.9	1.4	.9	− .6	4.6	4.1	3.7
2.5	.....	4.8	2.4	.....	.....	6.5	2.4	.6	.6	.8	.6	2.6	1.5	1.1	4.5
.....	.....	4.9	3.8	.....	.....	12.9	2.1	.7	.6	.7	.5	3.3	2.8	5.5	3.8
.....	.....	2.3	.2	.....	.....	8.4	6.5	.2	.3	.6	.3	2.8	2.4	2.6	3.0
.....	.....	6.1	2.6	.....	.....	11.7	4.3	.7	.5	.9	.9	4.3	.7	6.6	1.1
.....	.....	1.5	.5	.....	.....	7.7	5.0	.4	.5	.4	.1	−2.4	2.6	−1.2	4.2
.....	.....	4.0	2.4	.....	.....	.....	.....	.4	.3	.4	.4	.2	3.0	5.2	.0

TABLE 7.—*Averages and average deviations of height and weight increments of boys and girls from the Horace Mann School.*

	Boys.								Girls.							
	Height.				Weight.				Height.				Weight.			
	Above median.		Below median.		Above median.		Below median.		Above median.		Below median.		above median.		Below median.	
	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.	Average.	Average deviation.
	Cm.	*Cm.*	*Cm.*	*Cm.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
– 7	7.2	1.1	4.9	1.1	6.5	2.4	4.8	1.8	6.5	1.4	5.4	0.5	5.0	1.1	4.5	1.1
6½– 7½.....	5.6	.6	4.8	.9	4.7	1.8	4.6	.6	6.2	.6	5.8	1.1	5.9	1.4	4.2	1.6
7 – 8	5.9	.9	4.8	.7	7.3	1.8	5.5	1.5	6.2	1.2	5.6	.8	5.9	2.8	4.5	1.3
7½– 8½.....	5.9	.7	4.7	.7	7.5	1.6	4.9	2.0	5.4	.8	5.1	.9	6.5	1.8	4.6	1.5
8 – 9	5.6	.7	4.9	1.2	7.8	2.4	5.7	2.1	5.6	.9	5.1	.6	8.3	3.7	6.0	2.4
8½– 9½.....	5.2	.7	5.2	.9	6.1	2.1	4.9	1.2	5.7	.9	4.8	.6	7.8	2.3	5.1	1.9
9 –10	5.3	.7	4.8	.8	6.9	1.9	5.8	2.1	5.7	1.3	5.0	.7	8.7	4.3	6.4	2.6
9½–10½.....	4.9	.7	4.3	.6	6.9	2.3	6.0	1.1	6.0	.9	4.5	.5	7.9	3.4	5.8	2.5
10 –11	4.8	.6	4.2	.7	5.7	2.2	3.9	1.5	5.7	1.1	5.1	.9	8.7	3.3	7.7	3.0
10½–11½.....	3.7	1.0	4.0	.7	8.6	2.9	5.7	1.9	6.5	1.4	4.9	.9	11.1	4.4	5.9	2.2
11 –12	5.3	1.0	4.5	1.0	8.3	4.4	5.4	1.4	7.1	1.5	5.9	1.0	12.2	4.1	8.5	4.0
11½–12½.....	5.4	1.4	4.9	1.1	8.4	3.8	6.6	2.5	7.1	1.5	5.5	1.0	10.7	4.4	9.7	3.5
12 –13	6.4	1.4	5.1	1.3	13.1	6.9	7.6	2.7	5.7	1.6	5.9	1.5	11.1	3.2	10.8	3.7
12½–13½.....	6.5	1.7	5.4	1.3	10.3	4.9	7.2	3.4	5.1	1.4	6.4	1.0	11.8	4.4	13.3	6.9
13 –14	[1] 7.2	1.8	5.5	1.6	11.1	4.1	10.3	4.1	3.8	1.7	4.4	1.4	10.8	6.0	11.0	4.2
13½–14½.....	6.9	2.1	5.8	1.8	11.9	3.9	10.1	3.3	3.5	1.4	3.5	1.3	9.4	5.2	10.5	4.3
14 –15	6.5	2.1	6.6	2.4	11.7	4.8	12.0	3.3	2.8	1.6	2.7	1.6	8.0	4.3	7.8	4.3
14½–15½.....	6.4	2.3	6.2	2.4	11.2	5.6	14.1	1.8	1.2	6.3	1.8	1.6	5.7	3.2	9.5	3.5
15 –16	5.1	2.0	5.7	1.9	15.2	4.9	13.8	3.3	1.2	1.0	2.2	1.0	6.8	4.0	5.3	3.9
15½–16½.....	3.9	1.2	4.6	2.7	13.3	5.8	10.1	3.6	.8	.6	1.4	1.0	3.4	4.8	4.3	3.9
16 –17	4.9	2.6	3.7	2.3	9.6	4.5	7.3	1.8	1.2	.8	.8	.6	3.8	6.0	2.9	2.7
16½–17½.....	2.2	1.2	3.2	1.2	9.2	3.1	5.5	3.5	.4	.5	.2	.3	2.0	4.0	2.0	4.7
17 –18	1.5	.7	2.0	1.3	1.3	4.5	1.1	.0	.5	.4	.5	.5	3.9	4.3	5.2	2.0

[1] The braces show the periods of greatest annual increments; for those above the median this period is earlier than for those below the median.

Since these children were not all measured an equal number of times and, therefore, individuals are constantly entering and leaving the yearly and half-yearly groups, the sum of the averages of the half-yearly increments do not in all cases equal the averages of the yearly increments. These conditions vitiate the results in so far that we do not have a truly homogeneous group throughout. These facts explain why it is not possible to get an average increment by taking the difference between the average measurement of two intervals, since this method would in some cases give a minus quantity if a majority of tall individuals were in the former and not in the latter group. The individual increments also help to explain why the composite curve of the average heights based on single measurements of different individuals at different ages does not represent the growth of any individual or any group of individuals. Therefore the method of finding averages on single measurements, which has been universally used in the past (on account of lack of data based on consecutive measurements), must be abandoned as a method for obtaining norms.

The following are some of the greatest gains in height, weight, and lung capacity among all the boys and girls included in the entire study. Those whose numbers are below 200 have been taken from the tables just given and the other ones from the groups of individual growth curves. The largest increments of growth are as follows:

TABLE 8.—*Largest individual increments in growth.*

INCREASE IN HEIGHT.

BOYS BELOW THE MEDIAN HEIGHT.

Numbers.[1]	Age.			Height.	Age.			Height.	Increase in height.	
	Y.	*m.*	*d.*	*Cm.*	*Y.*	*m.*	*d.*	*Cm.*	*Cm.*	*Per ct.*
151	12	4	19	137.2	13	8	19	149.0	11.8	8.6
153	15	1	6	149.2	16	0	2	159.0	9.8	6.7
153	16	0	2	159.0	17	1	3	170.0	11.0	6.9
156	15	11	17	154.9	16	11	18	165.6	10.7	7.0
165	13	5	20	147.2	14	5	6	157.5	10.3	7.0
174	14	4	24	155.2	15	5	9	165.7	10.5	6.8

BOYS ABOVE THE MEDIAN HEIGHT.

Numbers.	Y.	m.	d.	Cm.	Y.	m.	d.	Cm.	Cm.	Per ct.
128	11	9	9	156.5	12	9	7	166.7	10.2	6.5
176	14	0	0	148.5	15	0	0	158.3	9.8	6.6
187	13	2	5	156.1	14	4	22	167.0	10.9	7.0
189	14	3	9	159.3	15	4	15	169.5	10.2	6.4

GIRLS BELOW THE MEDIAN HEIGHT.

Numbers.	Y.	m.	d.	Cm.	Y.	m.	d.	Cm.	Cm.	Per ct.
53	13	2	18	139.5	14	5	1	149.0	9.5	6.6
82	13	6	30	154.3	14	7	20	163.0	8.7	5.6
20	11	11	0	137.0	13	3	0	147.3	10.3	7.5
106	13	5	0	141.9	14	5	2	153.1	11.2	7.9
831	11	3	4	138.6	12	4	9	148.8	10.2	7.4

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[1] These numbers correspond to those in Tables 4, 5, and 13-22, and in the Health Notes, pp. 118-124.

TABLE 8.—*Largest individual increments in growth*—Continued.

INCREASE IN HEIGHT—Continued.

GIRLS ABOVE THE MEDIAN HEIGHT.

Numbers.	Age.			Height.	Age.			Height.	Increase in height.	
	Y.	*m.*	*d.*	*Cm.*	*Y.*	*m.*	*d.*	*Cm.*	*Cm.*	*Per ct.*
92	10	9	19	144.3	12	1	3	155.8	11.5	7.9
94	11	3	22	146.1	12	7	13	157.2	11.1	7.6
95	10	4	26	145.6	11	8	9	156.8	11.2	7.7
97	10	10	19	144.3	12	1	3	155.8	11.5	8.0
99	11	4	23	146.1	12	7	10	157.9	11.8	8.1
64	9	10	12	138.9	11	4	29	151.4	12.5	9.0
49	10	9	13	147.9	11	11	10	157.5	9.6	6.5
310	11	9	12	147.6	12	7	4	158.5	10.9	7.4

LARGEST INCREMENTS OF GROWTH IN WEIGHT.

BOYS BELOW THE MEDIAN WEIGHT.

Numbers.	Age.			Weight.	Age.			Weight.	Increment.	
	Y.	*m.*	*d.*	*Lbs.*	*Y.*	*m.*	*d.*	*Lbs.*	*Lbs.*	*Per ct.*
151	12	4	19	66.3	13	8	19	87.5	21.2	32.0
172	15	8	7	117.0	16	6	6	141.7	24.7	21.1

BOYS ABOVE THE MEDIAN WEIGHT.

176	14	4	26	93.2	15	5	9	117.5	24.3	26.1
140	9	8	3	70.2	10	8	15	87.6	17.4	24.7
146	11	11	2	110.7	12	11	7	133.1	22.4	22.0
191	14	6	5	108.0	15	6	24	132.0	24.0	22.2

GIRLS BELOW THE MEDIAN WEIGHT.

17	9	11	26	53.9	10	11	30	77.2	23.3	43.2
52	13	10	23	97.9	14	10	3	117.3	19.4	19.8
54	13	11	12	78.0	15	1	13	97.2	19.2	24.6
66	12	10	26	94.5	13	10	23	113.8	19.3	20.3
70	12	7	0	78.1	13	4	16	98.1	20.0	25.5
74	14	5	9	111.8	15	5	0	131.1	19.3	17.2

GIRLS ABOVE THE MEDIAN WEIGHT.

101	11	5	24	79.9	12	6	18	115.6	35.7	45.5
43	11	4	10	125.0	12	5	8	149.9	24.9	18.0
2160	10	2	21	72.2	11	2	20	96.8	24.8	34.3
47	11	3	10	104.5	12	3	14	124.9	20.4	19.5
98	12	6	11	127.0	13	9	24	147.8	20.8	16.3
100	12	9	0	103.2	13	7	24	124.2	21.0	20.3

LARGEST INCREMENTS OF GROWTH IN LUNG CAPACITY.

BOYS BELOW THE MEDIAN HEIGHT.

Numbers.	Age.			Lung capacity.	Age.			Lung capacity.	Increment.	
	Y.	*m.*	*d.*	*Cu. in.*	*Y.*	*m.*	*d.*	*Cu. in.*	*Cu. in.*	*Per ct.*
151	14	4	8	163	15	4	7	210	47	28.8
153	16	0	2	170	17	1	3	220	50	28.8
162	16	3	6	215	17	3	3	265	50	23.2
171	10	10	1	106	11	11	21	150	44	43.4

TABLE 8.—*Largest individual increments in growth*—Continued.

LARGEST INCREMENTS OF GROWTH IN LUNG CAPACITY—Continued.

BOYS ABOVE THE MEDIAN HEIGHT.

Numbers.	Age.	Lung capacity.	Age.	Lung capacity.	Increment.	
	Y. m. d.	Cu. in.	Y. m. d.	Cu. in.	Cu. in.	Per c
128	11 9 9	184	12 9 7	230	46	25.
139	12 1 21	100	13 1 20	145	45	45.
179	13 9 22	152	14 10 13	218	66	36.
187	13 3 5	164	14 4 22	212	48	28.
192	13 7 14	188	14 3 24	238	50	26.
199	13 1 26	190	14 2 0	240	50	33.

GIRLS BELOW THE MEDIAN HEIGHT.

Numbers.	Age.	Lung capacity.	Age.	Lung capacity.	Increment.	
14	11 2 9	112.8	12 1 6	180.0	67.2	59.
19	12 0 7	130.0	13 0 15	180.0	50.0	38.
20	11 1 19	76.0	12 1 2	112.0	36.0	46.
21	9 7 24	95.0	10 6 27	130.0	35.0	36.
53	13 3 18	128.0	14 5 2	160.0	32.0	25.

GIRLS ABOVE THE MEDIAN HEIGHT.

Numbers.	Age.	Lung capacity.	Age.	Lung capacity.	Increment.	
36	10 2 7	96	11 8 11	159.2	63.2	65.
46	6 5 17	70	7 5 17	108.0	38.0	54.
46	11 4 8	142	12 4 0	190.0	48.0	33.
86	13 10 14	154	10 5 0	190.0	36.0	23.
86	14 10 5	190	15 10 2	234.0	44.0	23.

The greatest yearly gain in height for these boys below the media is approximately 10 centimeters per year, and as a rule these gain are made after 14 years of age; for those above the median the gai is approximately the same, but occurs at 14 or earlier. The greates gain in height for girls below the median is from 9 to 11 centimeters and occurs after 12 years; for those above the median height it i from 10½ to 11 and occurs before 12 years of age.

The greatest gains in weight are after 12½ for the boys below th median and earlier for those above median height, as a rule. Fo the girls the greatest gains are after 13 for those below and before 1 for those above the median.

The greatest gains in lung capacity are after 14 as a rule for the boys below median height and before for those above median height. Fo girls there is little difference between those above and those below median height.

In an extensive study on physical growth, based on single meas- urements, Dr. H. P. Bowditch[1] calls attention to the asymmetric nature of the trend of the growth curves and holds that large, ta children make their most rapid growth at an earlier age than the sma ones, since the average and median values do not coincide. By usi the same data, given by Bowditch, Dr. Franz Boas[2] applies suppl mentary statistical methods and concludes that Bowditch's conc sions are untenable. He says:

> The asymmetry is not accidental, for there will be as many children on a [illegible] development corresponding to that of their age plus a certain length of time as sponding to that of their age minus a certain length of time.

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[1] Bowditch, H. P. Growth of children. Tenth [illegible] Health.

[2] Boas, F. On Townsend Porter's investigati [illegible] St. Louis.

In his several reports on the growth of St. Louis children, Dr. William T. Porter[1] finds the same asymmetrical trends noted by Bowditch and repeatedly calls attention to the difference between the mean and average. Boas very plainly states: "I can not acknowledge that the conclusions reached regarding the growth of tall and short children are correct." He finds the constant occurring differences and their regular distribution between the mean and the average furnish the best proof that the curves under consideration are not probability curves. He believes, if this is the case, neither the average, nor the mean, nor the most frequent value represents the type of the age to which the curve refers. This can be determined only by detailed examination of the causes of the asymmetries.

To summarize briefly the differences in the two points of view Boas maintains that—

> When we consider children of a certain age, we may say that they will not all be on the same stage of development. Some will have reached a point just corresponding to their age, while others will be a little behind, and still others in advance of their age. Consequently the values of their measurements will not exactly correspond to those of their age. We may assume that the difference between their stage of development and that belonging to their exact age is due to accidental causes; so that just as many will be less developed as further developed than the average child of a particular age. Or there will be as many children on a stage of development corresponding to that of their age plus a certain length of time as corresponding to that of their age minus a certain length of time.—*Science, n. s. 1., 227.*

Porter's assumptions are based on Bowditch's data as well as his own, and he maintains that—

> The type of a certain deviation from the mean of an age will show the same degree of deviation from the mean at any subsequent age; for example, a type boy in the 75 percentile grade at age 6 will throughout his growth be heavier than 75 per cent of boys of his own age.—*Transactions of the Academy of Science of St. Louis, 4, p. 293.*

Boas objects to this assumption and holds that the average children do not hold their percentile rank. The individual growth curves included in the present investigation should go a long way toward solving this much-disputed question. It will be shown that both writers are partially correct, but neither could see the significance of his conclusion from the data at hand.

8. INDIVIDUAL GROWTH CURVES.

(*a*) HEIGHT AND WEIGHT.

The series of 28 charts show the individual growth curves in height, weight, and lung capacity for 170 individuals, giving in all 510 individual growth curves for various periods between 3 years 9 months and 18 years 6 months.

In carrying out a comparis [illegible] ong forms so dissimilar in absolute size as those [illegible] and lung capacity, it was thought best to use the following units. In the height and weight curves the same base line division of 20 millimeters equals 12 months in age, while for the ordinates or vertical lines 40 millimeters equal 20 centimeters in height and 10 millimeters represent 20 pounds in weight. In the lung capacity charts a base line division of 15 milli-

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[1] Porter [illegible]

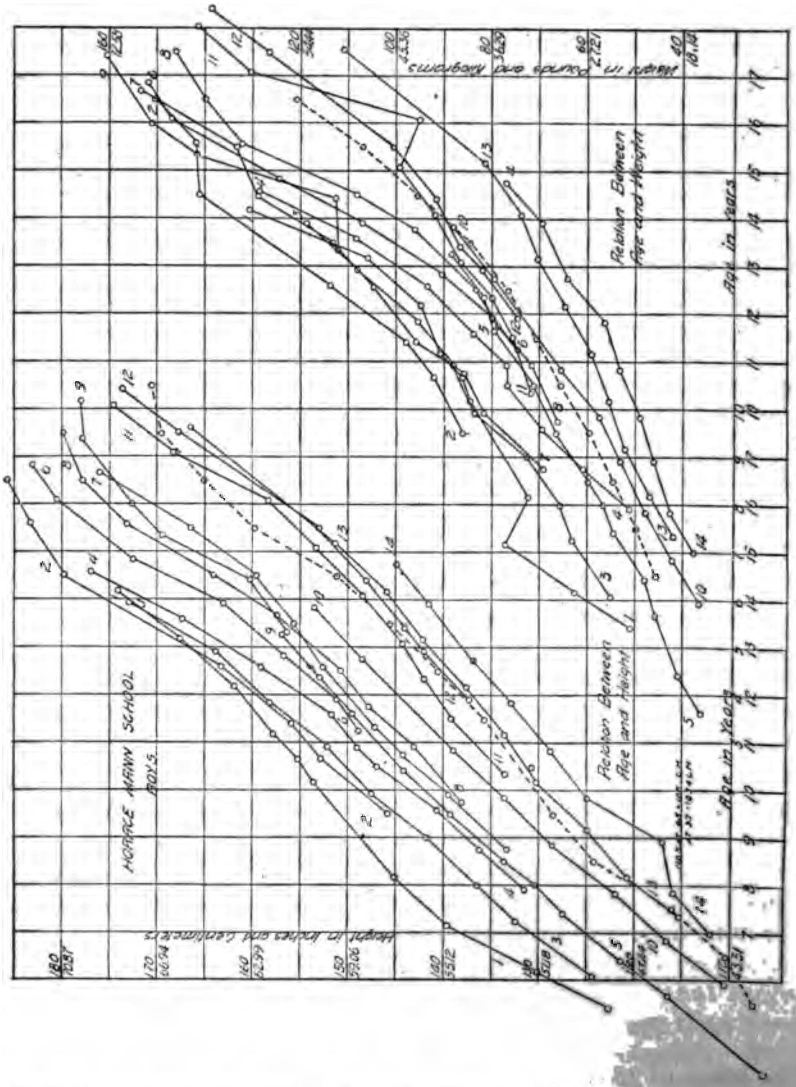

FIG. 1.—(Chart Ia) Height and weight curves for Horace Mann School boys.

meters is used for 12 months in age, and in the vertical or ordinate
10 millimeters represent 20 cubic inches in l
nal charts have been reduced in size and
out. The black lines repr
height and weight charts
capacity charts.

The same Arabic numerals refer to the same individuals, respectively, for each of the 15 groups for all curves, for all health notes, and for all indices. The circles give the time of measurement; the ordinates represent the measurements accurately to within 0.4 of a centimeter or less, and the abscissæ the exact age within 14 days or less.

It is at once apparent that the direction of the curves shows the absolute increase, decrease, or uniformity of the increment of growth. A straight line of uniform pitch indicates an absolute increment for the same individual; therefore, in general, the degree of pitch of the line (curve) shows the relative amounts of increase of absolute increments for the same individual, and a change of the direction of a line at any circle (or point of measurement) indicates a decrease in the absolute increment if the line turns toward the horizontal, and an increase if it turns toward the vertical. The charts, therefore, like most growth curves, show graphically the absolute increments and not the percentage of increase over the initial measurements from period to period. The relative gain or per cent of increase or decrease may be obtaind from the preceding tables (4, 5, and 13–22) for comparison, if desired.

It should be noted that no attempt to select the individuals was made in the charts except to include a few that are tall and a few that are short in order that the height curves may be followed individually from measurement to measurement. The wide distribution of individuals from tallest to shortest may be noticed as a general characteristic of this group; there is a range of 35 centimeters in height between the tallest boy and the shortest boy at 14½ years. Since this wide range of distribution is uniformly present for all ages, a comparison of the growth of some very tall children with some short ones may be nicely observed when compared with the dotted curve which is "Boas's normal curve" based on the measurements of 45,151 boys for *one* measurement each.

A study of these height curves reveals at once that each boy holds approximately his relative position in the group for the periods included (Nos. 1, 8, and 9 are the only curves that cross, and in only one of these instances are two curves intersected), and on a percentile basis each would retain approximately his percentile grade; and that the relative shifting of the beginning of the adolescent acceleration from 12½ years for the tallest boy (No. 2) to 16 years for the shortest boy (No. 11) is a notable characteristic which has been referred to from time to time in the preceding pages. Occasionally there is a slight retardation before pubescent acceleration [illegible] r with the shifting of the period, causes the [illegible] arance a series of concentric arcs of [illegible] gical point in the lower or outer arcs [illegible] upper arcs. If No. 1 curve, which is abnormal, is eliminated, there may be observed a fanning out of the curves from childhood to adolescence. When the individual growth curves in height for all the boys from both schools are compared, it will be noted that there is frequently an individual fluctuation in growth from 6 to 8 years of age, depending on the size of the boy, and

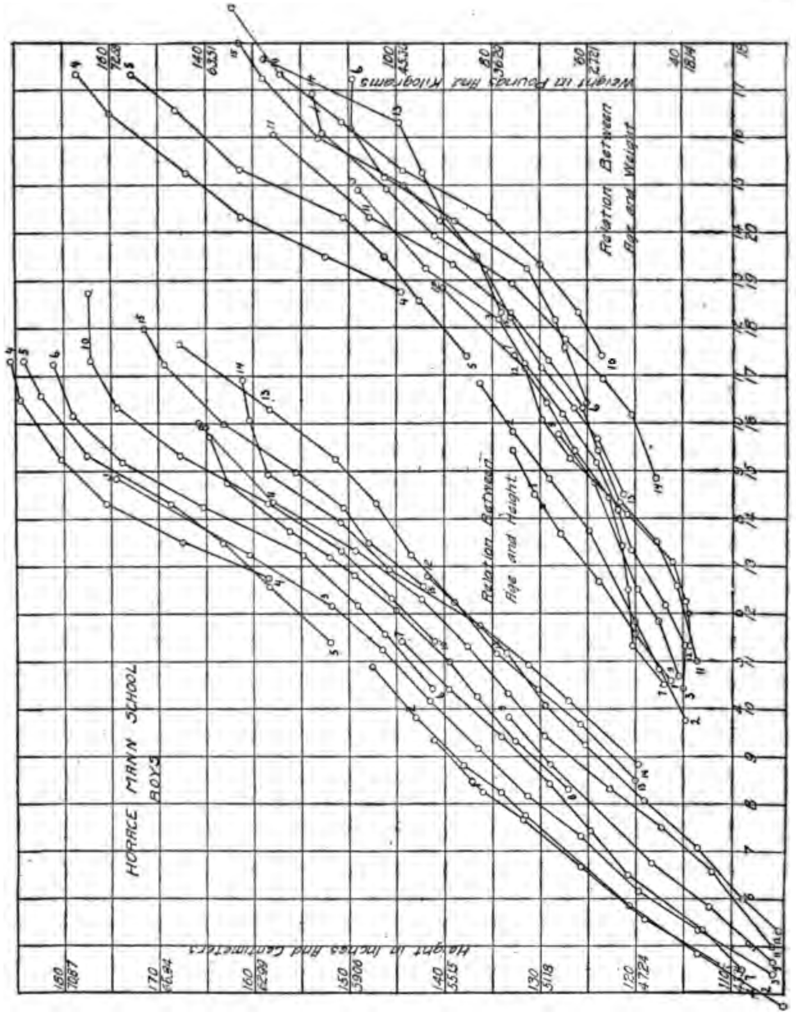

FIG. 2.—(Chart IIa) Height and weight curves for Horace Mann School boys.

there is a remarkable uniformity in the increase of increment after 6 or 8 years to the period of pubescent acceleration, with a slight decrease just before the adolescent acceleration.

The girls' curves illustrate at a glance smaller stature than that of the boys before 11 years and after 14. There is also here a uniformity in regard to relative stature for each individual throughout the periods included, and an earlier pubescent acceleration in the cases where there is an increase during this period. The general trend of these curves shows slight decrease in increments from 7 years to the accelerated period, which like that of the boys, varies in occurrence with the initial height; the period of rapid growth is earlier for the taller girls; the shorter girls, like the shorter boys, reach their maturity in growth at an older age. In Chart IVa (p. 42), for example, the tallest girl of the group attained her maximum height at 14½ years of age and the shortest at 17 years and 3 months.

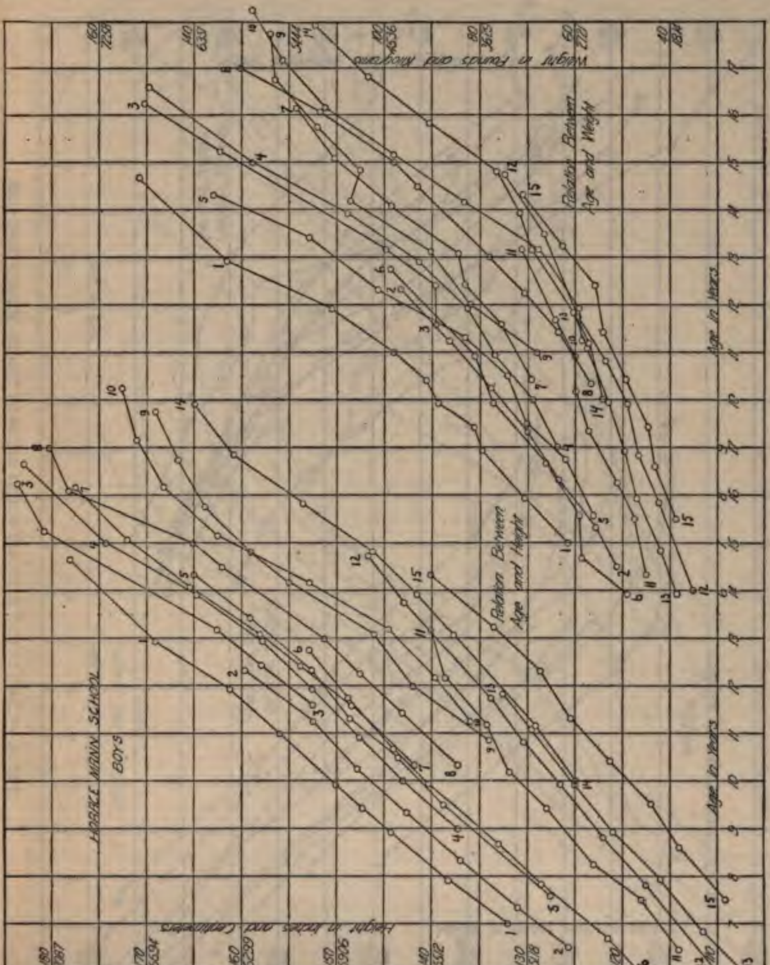

FIG. 3.—(Chart IIIa) Height and weight curves for Horace Mann School boys.

When the curves for the girls are extended to the earlier periods of childhood, there is a suggestion of change or variability in the increments from 5 to 7 years of age, wi a small range of differences similar to the boys during these ere is a slight drop in the curves, as a rule, betwee years, aside from the curves No. 1 and No. 9 of Chart Va, for example, which show n retardation or acceleration during the prepubescent and pubescen periods; the drop is more noticeable with girls than with boys. A period of marked retardation before adolescence is usually followed b a period of rapid acceleration during adolescence. If the increment o growth before adolescence is relatively uniform, this uniformity tend

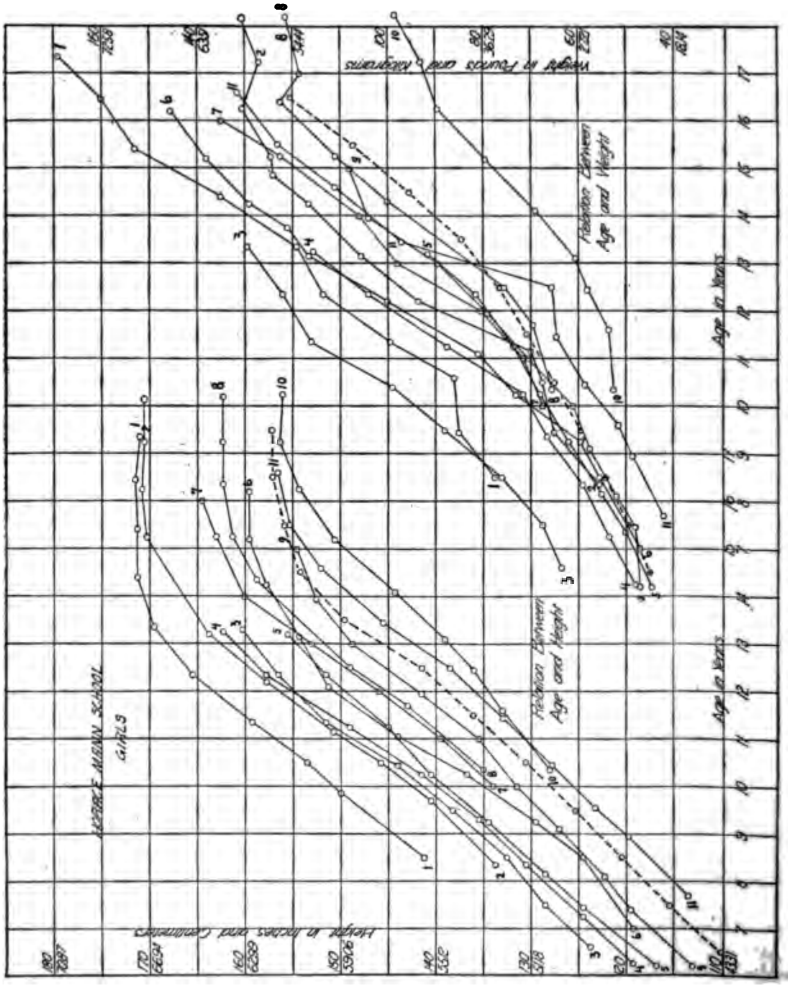

FIG. 4.—(Chart IVa) Height and weight curves for Horace Mann School girls.

to persist throughout adolescence; and, as may be noted with No in Chart Va (p. 43) and No. 1 in Chart Ia (boys) (p. 38), when the unusually rapid growth for the individual from 7 years to the begin of adolescence, there is a decrease during adolescence, i. e., a of the common rhythmic order.

The Francis W. Parker boys, when compared with Mann boys, show a closer range of distribution durin they are inferior, on the average, in stature, and show more individual fluctuations from measurement to measurement, which may be due, in some instances, to slight variations of the conditions under which the measurements were made, such as the time of day, the reading of the stadiometer, or rhythms occurring during certain times of the month or year, since the measurements were taken at

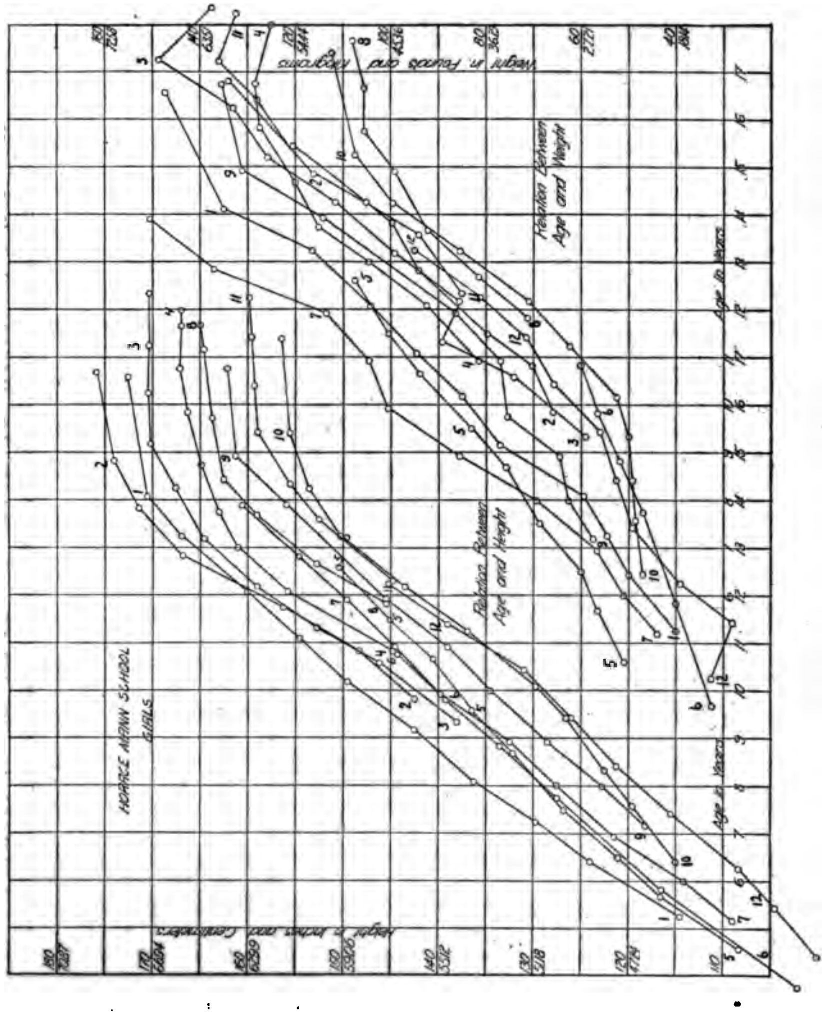

FIG. 5.—(Chart Va) Height and weight curves for Horace Mann School girls.

such short intervals that the variation of a few centimeters would be very apparent in the curves as plotted.

The 22 individuals in Chart XIIIa and XIVa are from the University
of Chi
nes similar to those of the Francis W.
Park
f a much larger body of students.
at random, but in Chart XIVa
rested growth. The growth

curves in height for both groups, like all the Horace Mann School children, show fewer individual fluctuations than those of the Parker School and, aside from No. 5 (Chart XIVa), there is a very close parallelism between the varying heights and the varying weights of the different individuals, i. e., the taller children are the heavier.

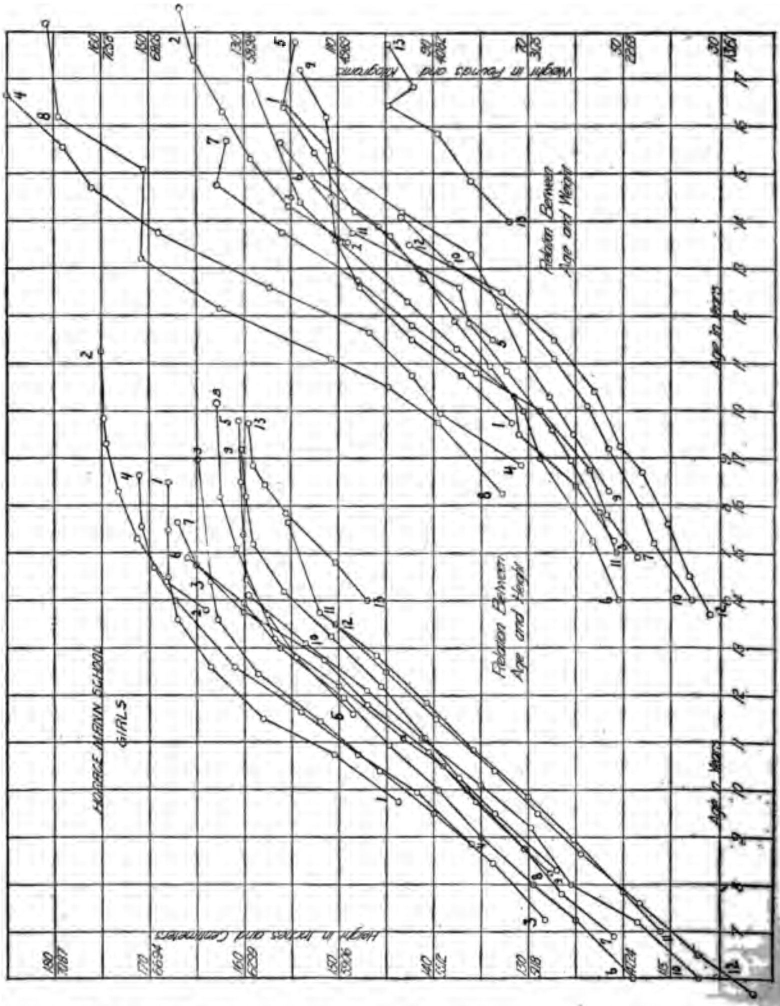

FIG. 6.—(Chart VIa) Height and weight curves for Horace Mann School girls.

No. 1 (Chart XIVa) is the tallest girl included in this study and he weight curve deviates from the general tendency in that its form similar to the height curve. The per cent of increase in height increments over the initial heights for a given chronological to 18 is so comparatively uniform for each individual tha curves may enable one, in the futu with accuracy how tall a child of norma age within the interim, providing his or her relation to a given median, or norm, be known.

The trend of the height curve, aside from the period just previous to the accelerated pubescent growth, tends toward convexity. If there is unusually rapid growth for the individual from 7 years to

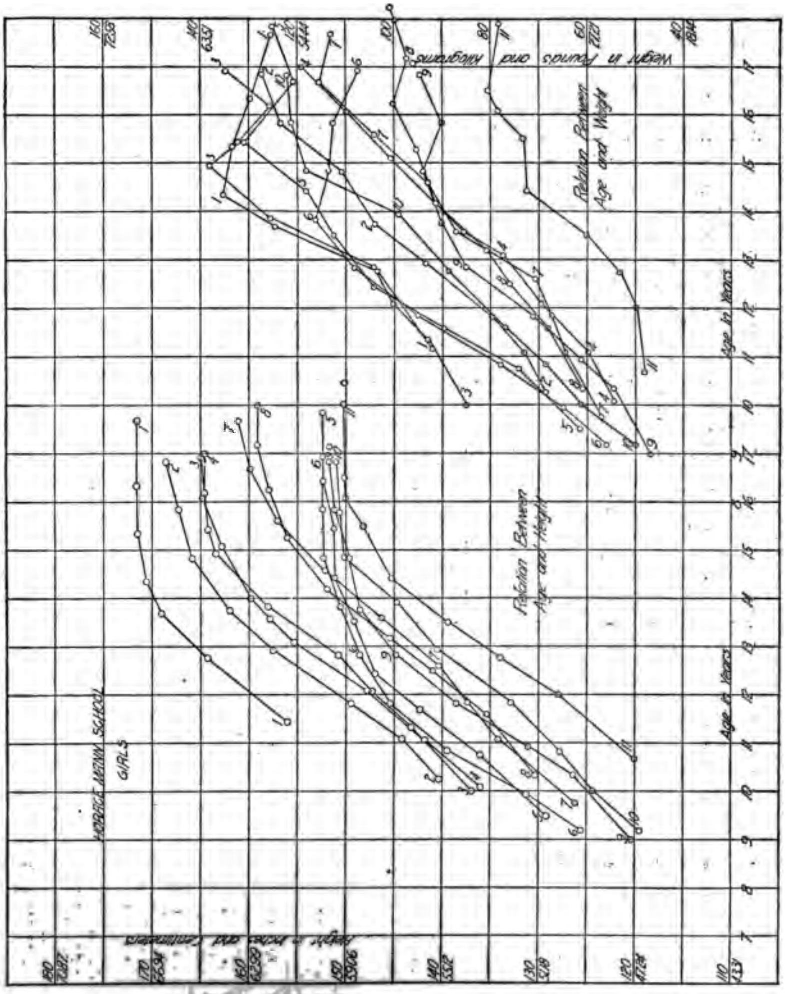

FIG. 7.—(Chart VIIa) Height and weight curves for Horace Mann School girls.

the beginning of adolescence, [illegible] a is a decrease during adolescence, and there is frequently a reve [illegible] he common rhythmic order.

Of the 170 boys and girls [illegible] ht curves are plotted for the preadolescent and adol [illegible] how a regular uniform rate of increase at [illegible] ber show an accelerated

The cases of marked arrest, or retardation, in growth in height with this group of children occur usually during the early adolescent period and persist through the period.

WEIGHT.

The individual weight curves have certain characteristics which are interestingly significant when compared with the height curves.

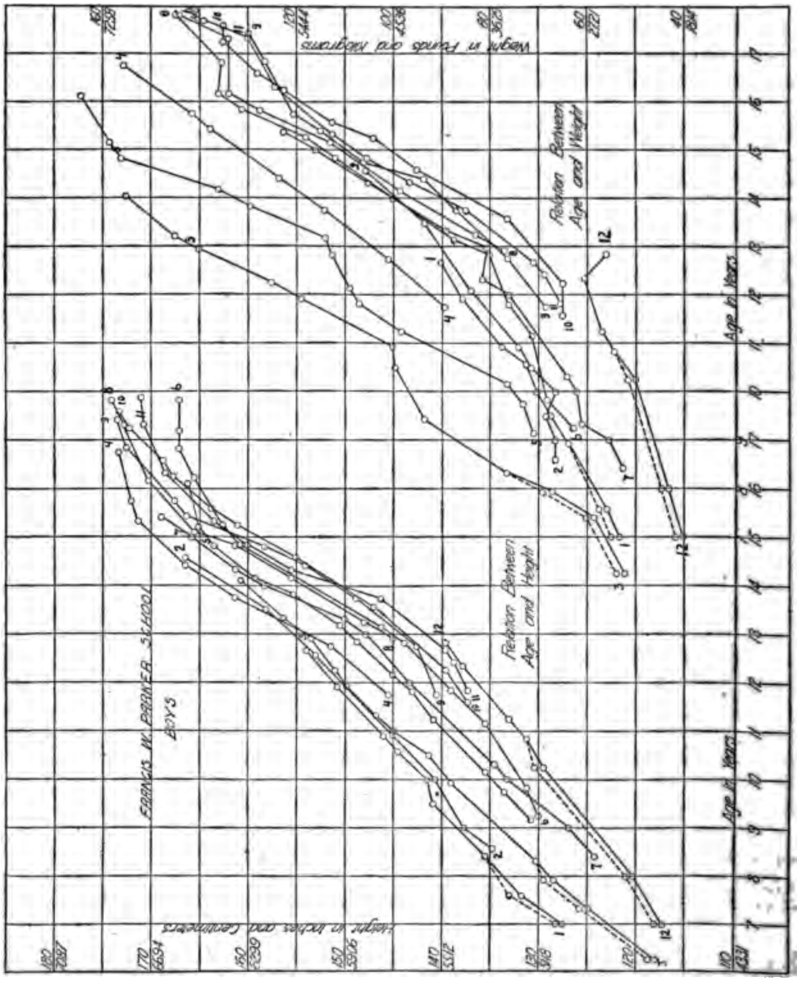

FIG. 8.—(Chart VIIIa) Height and weight curves for Francis W Parker School boys.

With the exception of No. 9 (Chart Ia), who is heavier than the others for his height, the boys' heights and weights are as a rule relatively proportionate to each other. The five boys below median height (Nos. 10, 11, 12, 13, and 14 of the first chart) are also the five lightest, with the exception of No. 10, whose nutrition is poor. The boys hold the same relative positions in the series in reference to both heig weight.

Though there are more individual fluctuations in growth in weight an in height, there is also a wide range of individual differences, as own by the fact that No. 2 of the first group at 14 years of age is 0½ pounds heavier than No. 14. The striking differences between the wo series of curves are: The weight curves tend toward concavity nd the height curves toward concavity just before the pubescent

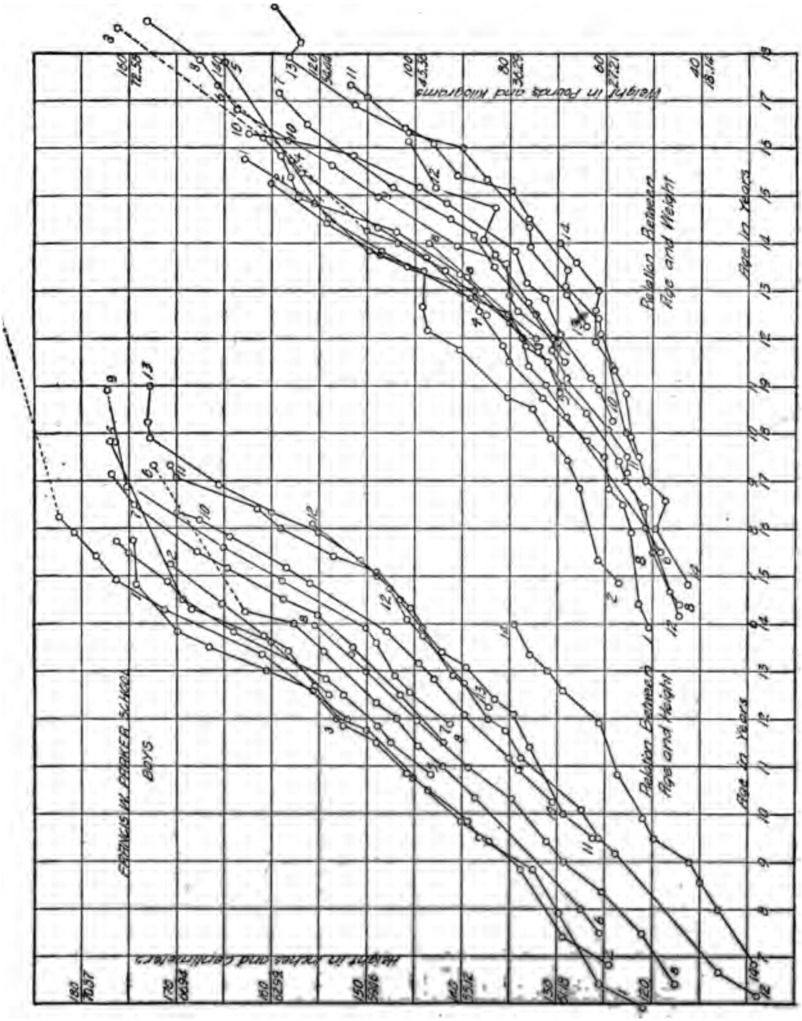

FIG. 9.—(Chart IXa) Height and weight curves for Francis W. Parker School boys.

celeration, and then both toward convexity; the height curves ever fall below the previous measurement, nstances r a millimeter or two, and the weight w e previous measurement. In several nd these losses divert the curves from e group, which may lat

The curves of weight show to a marked degree a decrease in relative increment from 6 to 11 or 13 years of age, the latter limit varying with the relative height and weight of the individual. After this there is a marked acceleration. The uniformity of increase in height and weight increments certainly tends, on the whole, to call attention to the value of the vigilant watching and remedial exercises on the part of the examiners in this school, and at the same time gives concrete evidence of the great value of physical examinations and medical inspection for growing children.

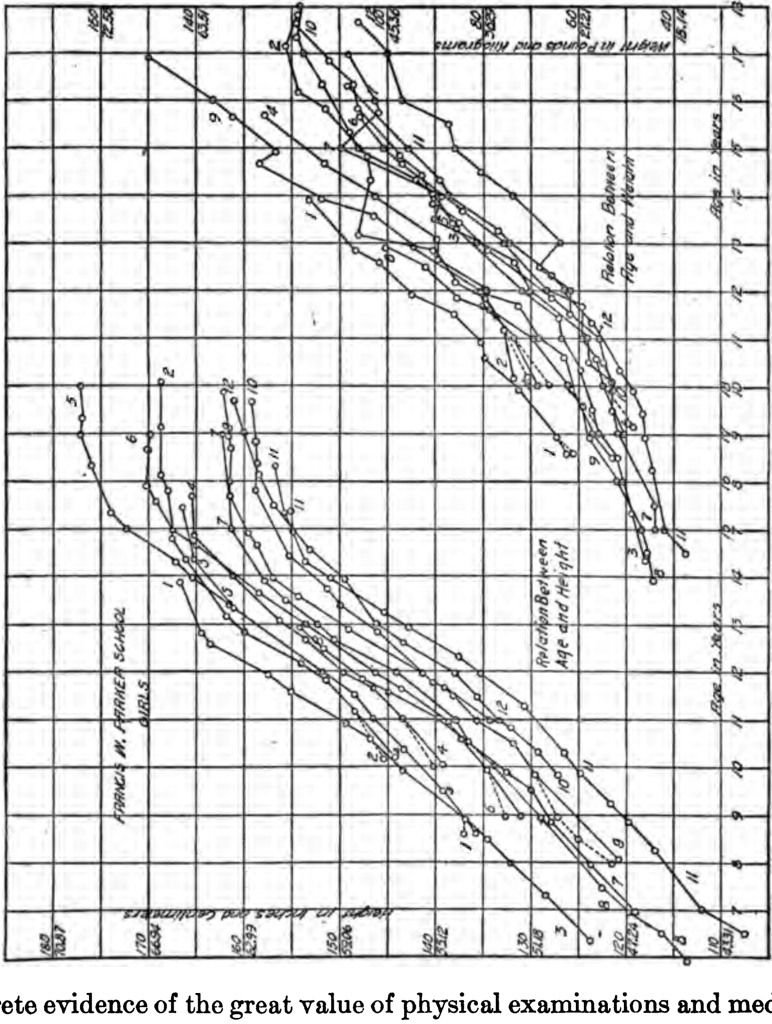

FIG. 10.—(Chart Xa) Height and weight curves for Francis W. Parker School girls.

Girls are relatively heavier than the boys, and the weight curves show less tendency toward concavity, with slightly more individual fluctuations. There are no cases of a loss of weight previous to 16 years of age; in many instances (Chart IVa, for example) the taller girls are as a rule heavier. In a general way each individual retains her relative position in regard to height. In Group V there are three cases of loss in weight after 17 years of age and two previous to this age. No. 7 diverts from this tendency of her group, being the heaviest after 8 years.

There is apparent confusion in the complexity of weight curves for Group VIIa, but if the curves of those whose growth in height was arrested are eliminated, and allowance is made for a decrease for the last year of the period in this chart, the remaining curves tend to follow those of the other groups. The continued retardation in the curves in height is paralleled by a similar period of arrest in weight. The instability in growth in weight is represented by a mass of intersecting curves in Chart XIa. No. 5 loses in weight in a manner similar to the retardation of growth in height, but the loss in weight does

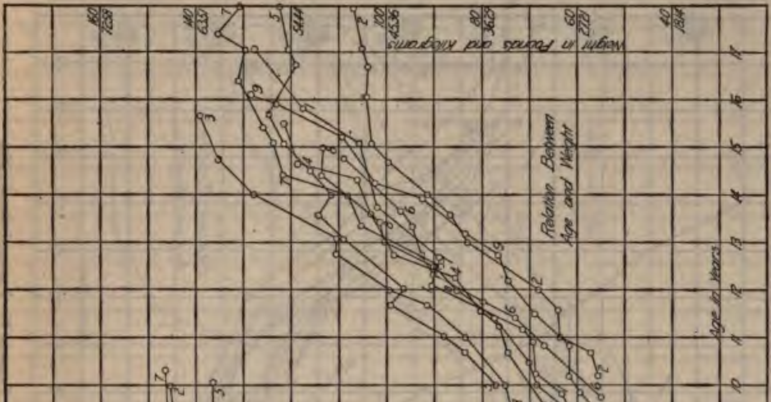

Fig. 11.—(Chart XIa) Height and weight curves for Francis W. Parker School girls.

not occur until a year and a half later than the loss of growth in height. In general, an arrest of growth in height after 15 is also accompanied in this group by a cessation of growth in weight, which is unusual. Some other unusual relationships between height and weight are illustrated in Chart XIIa; these are particularly evident in the case of No. 1, who, while fairly tall, is symmetrical and fat, with a marked deviation from any of the previous weight curves, and No. 5, who is also overweight, and illustrates the same type of deviation. Most of the other girls are under weight, but show no unusual tendencies. The weight curves of the very stout girls in this group are strikingly similar to those in the other charts.

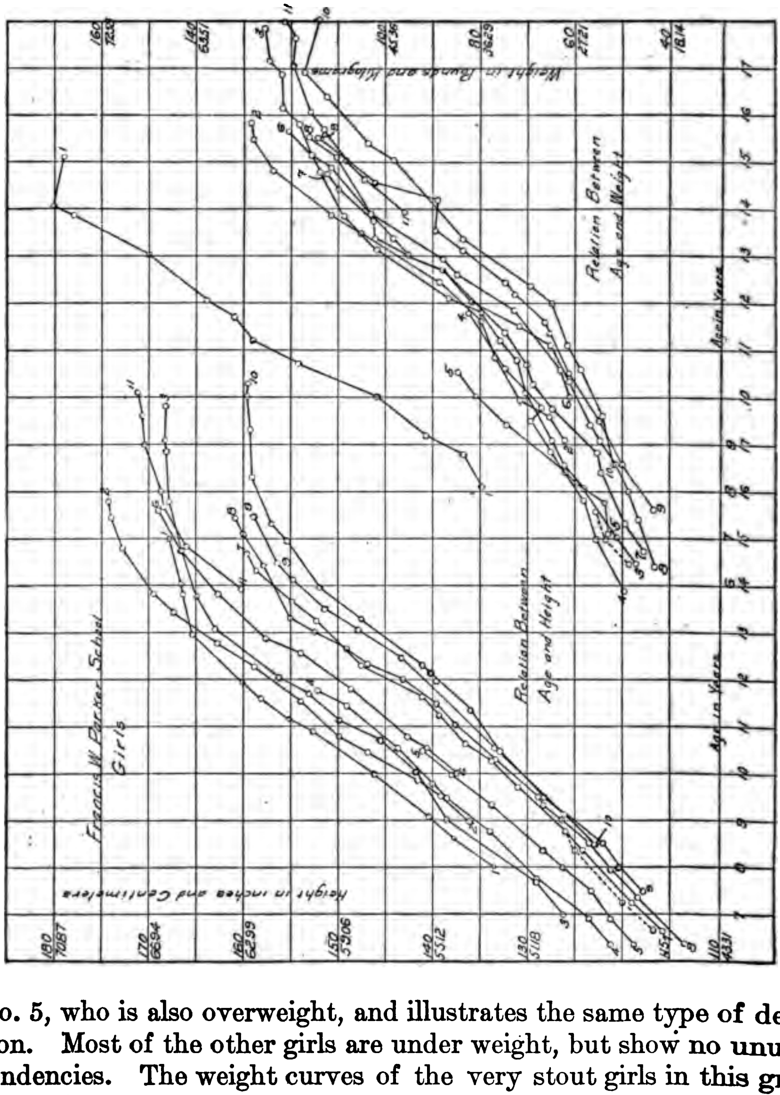

FIG. 12.—(Chart XIIa) Height and weight curves for Francis W. Parker School girls.

The trend of the weight curves in contrast from the height curve is toward concavity, with more marked concavity (or loss of increments of gain between 8 and 13 years) for boys than for girls.

The weight curves are characterized by a period of rapid acceleration during adolescence, except in cases of marked arrest, which are usually accompanied by marked arrest in growth in height. There are very few curves of a uniform increment of growth during adolescence.

Marked arrests of growth in weight, like those of height, occur during the adolescent period.

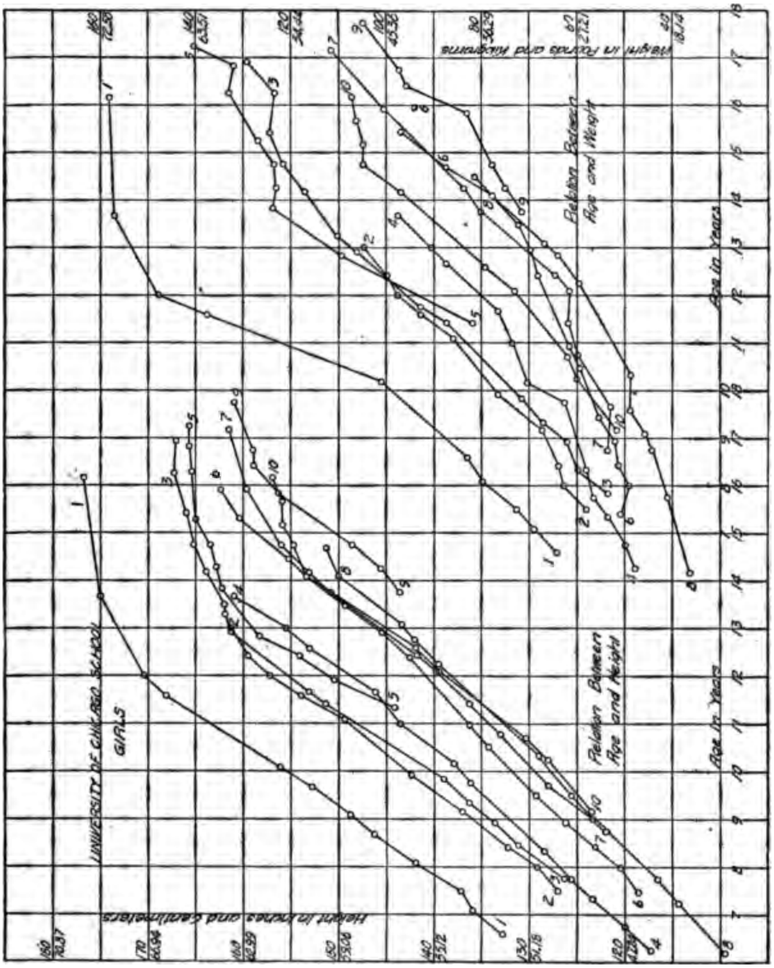

Fig. 13.—(Chart XIIIa) Height and weight curves for University of Chicago Elementary and High-school girls.

The heavier boys and girls are the taller boys and girls, and there is a close parallelism between the relative rank in height of a boy or girl and his or her relative weight within a group.

The boys and girls below median height have their periods of rapid pubescent acceleration in weight later than those above, since the same general principles of physiological age hold for weight as for height.

(b) LUNG CAPACITY.

It will be noted in the boys' lung capacity curves that No. 9, i the first chart, who is relatively heavier than the others for his heigh also has more lung capacity. This is significant, since the other boy hold approximately their relative places for height, weight, and lun capacity. For example, in the third group (Chart IIIa) there are

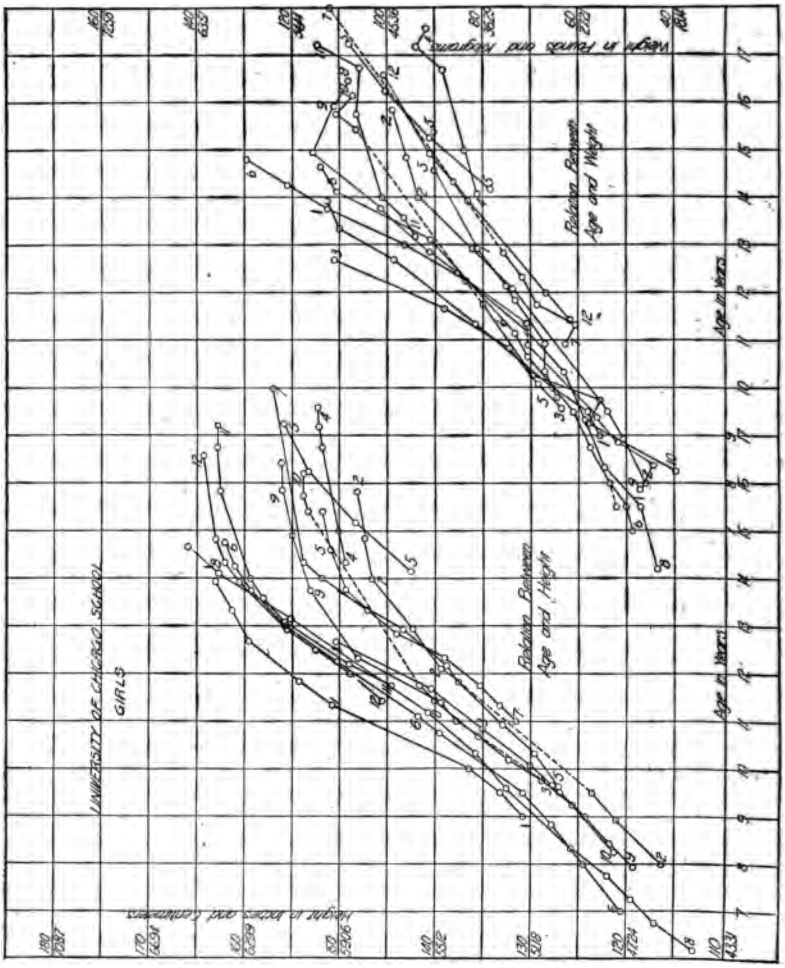

FIG. 14.—(Chart XIVa) Height and weight curves for University of Chicago Elementary and High-school girls.

number of short, light boys in the group, and, as would be expecte there are a number of boys with inferior lung capacity. The fluctu tions in growth in height in the case of No. 11 are also apparent i the lung-capacity development. Like weight, lung capacity show occasional losses, and the curves tend toward concavity, whic shows the increments increase less from 9 to 13 than during any oth period for boys. The rapid gains and losses at the beginning ma

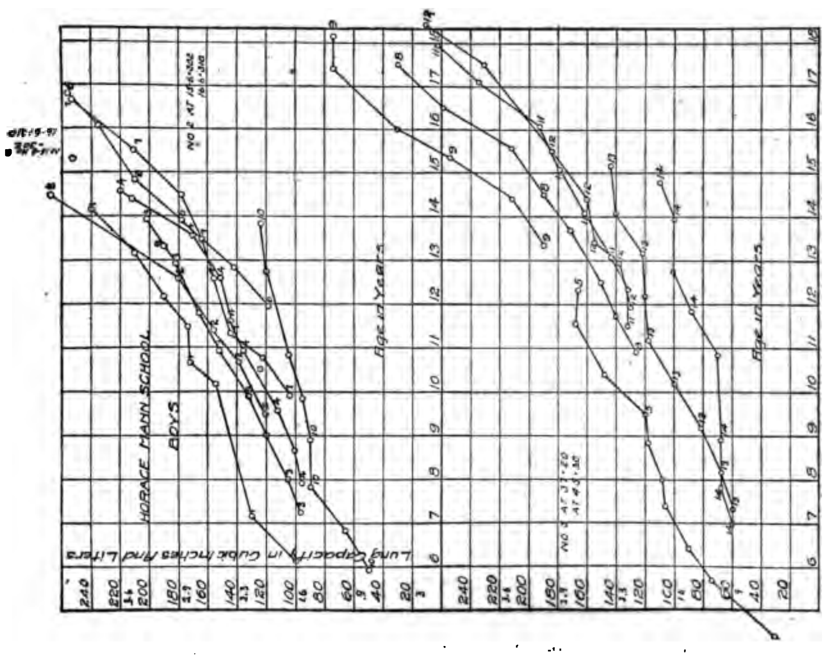

FIG. 15.—(Chart Ib) Lung-capacity curves for Horace Mann School boys.

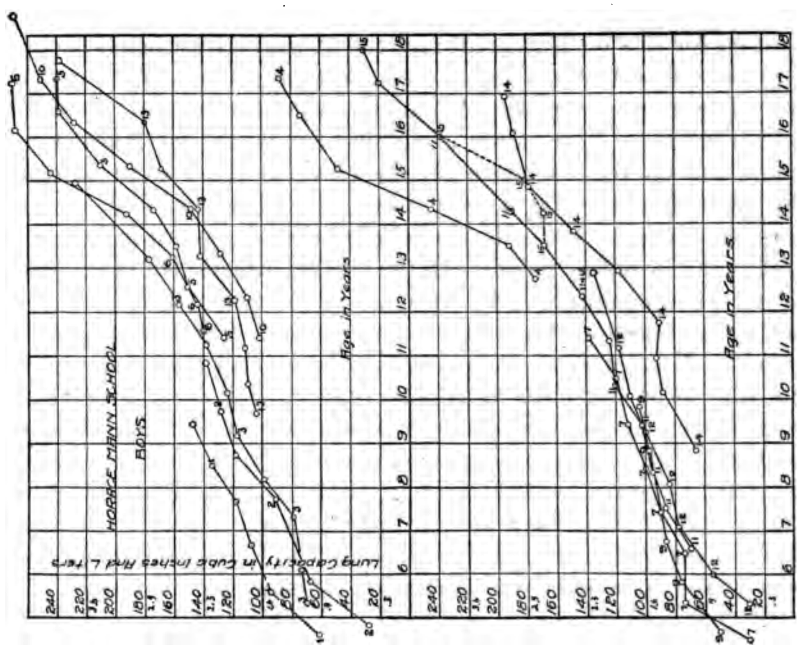

FIG. 16.—(Chart IIb) Lung-capacity curves for Horace Mann School boys.

be due in several instances to the new factor of voluntary control required for this measurement and the mental adjustments necessary to meet such a test. These curves, like the others, show comparatively few cases of crossing when the large numbers of possibilities are considered. The range of differences is not so marked as in height the curves are more closely grouped than those of weight. There is a close massing of the curves for the Francis W. Parker boys.

Among the girls some striking similarities to growth in height and weight may be noted in regard to the normal direction of lung capacity curves. For example, in Chart Va, No. 1 shows little or no acceleration at adolescence; the same is true for No. 9 in height and lung capacity; No. 5's curves are very similar, as also are those of Nos. 4 and 10. It is apparent the girls' lung capacity curves show less concavity or decrease in absolute increment between 9 and 14 than the boys. This may be explained on the basis that the girls are becoming superior to the boys in height and weight during this period, only to drop back later in height, weight, and lung capacity. The lung capacity curves of the girls differ in their general trend from those of the boys and follow the same tendency as the weight curves of the girls.

In Chart XIVb the same arrests in lung capacity are illustrated as in height and weight. This is particularly true of Nos. 4, 7, and 11, and also of No. 12, who is very light, but tall, and has an exceptionally small lung capacity. The lung capacity curves, like those of height and weight, are irregular, and are indicative of instability of uniform increase in development. The long interim between measurements is responsible in some instances for the crossing. In Chart VIIb there is a peculiar massing of curves, due to the arrest of Nos. 5, 6, 8, 10, and 11. No. 1's position may be due to some after effect of pneumonia. The close relation between weight and lung capacity is again illustrated in No. 1 of Chart XIIb, who is extraordinarily stout, with large lung capacity; No. 3 shows the same retardation in lung capacity as in height and weight.

While there are several cases of parallelism in relative positions in height, weight, and lung capacity, there are some interesting exceptions. In Chart IVb, Nos. 2, 6, and 8 are underweight and have less lung capacity than their heights would seem to justify. No. 8 has a poor health record, and the other cases would help to augment the suggestion previously made that there is a closer relationship between lung capacity and weight than with height. This is contrary to popular opinion, and will be discussed more in detail later. The girls are inferior to the boys in lung capacity in the later adolescent period, which may be explained to some extent on the basis of hygienic conditions and dress.

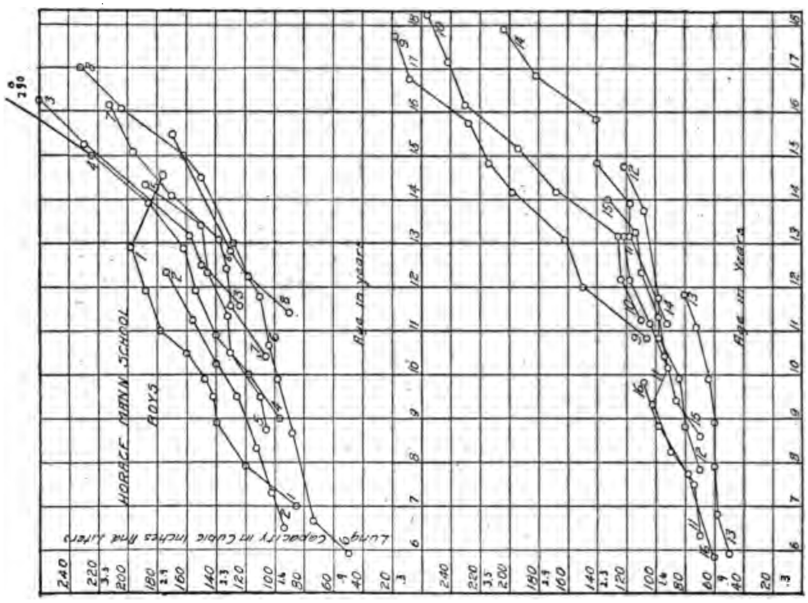

FIG. 17.—(Chart IIIb) Lung-capacity curves for Horace Mann School boys.

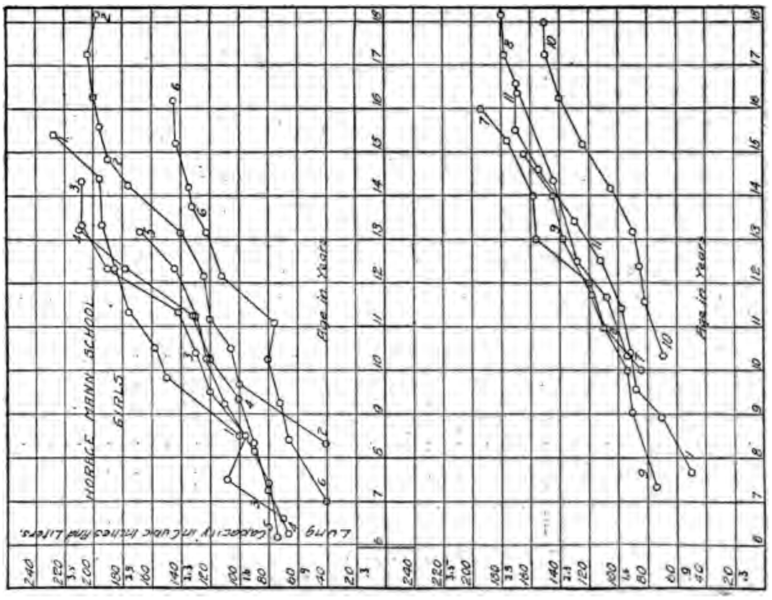

FIG. 18.—(Chart IVb) Lung-capacity curves for Horace Mann School girls.

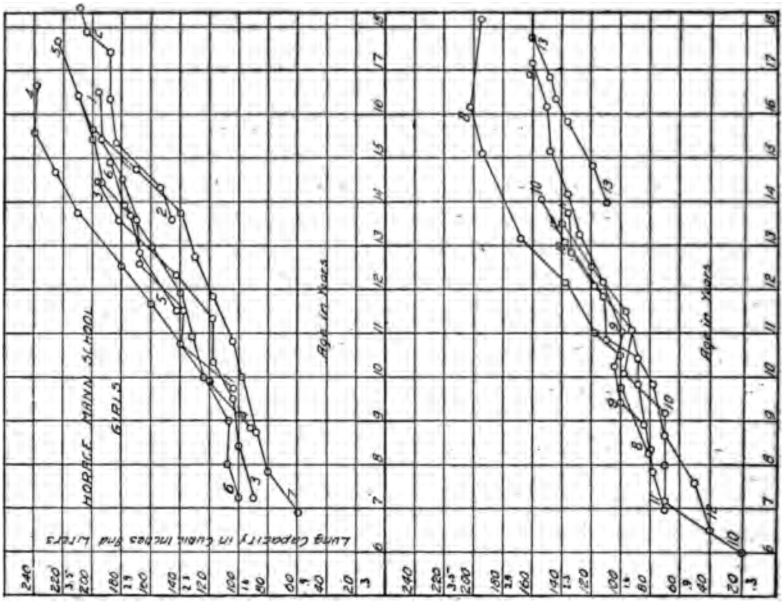

FIG. 20.—(Chart VIb) Lung-capacity curves for Horace Mann School girls.

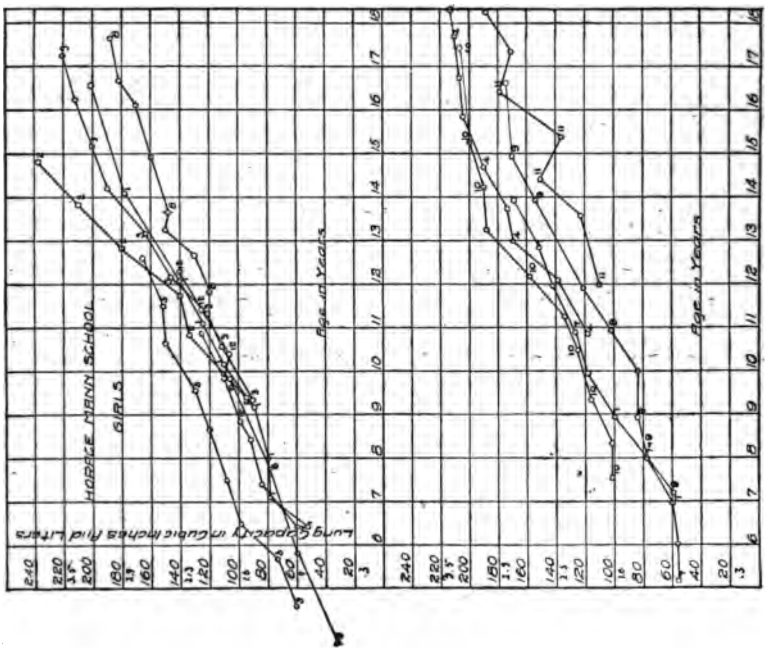

FIG. 19.—(Chart Vb) Lung-capacity curves for Horace Mann School girls.

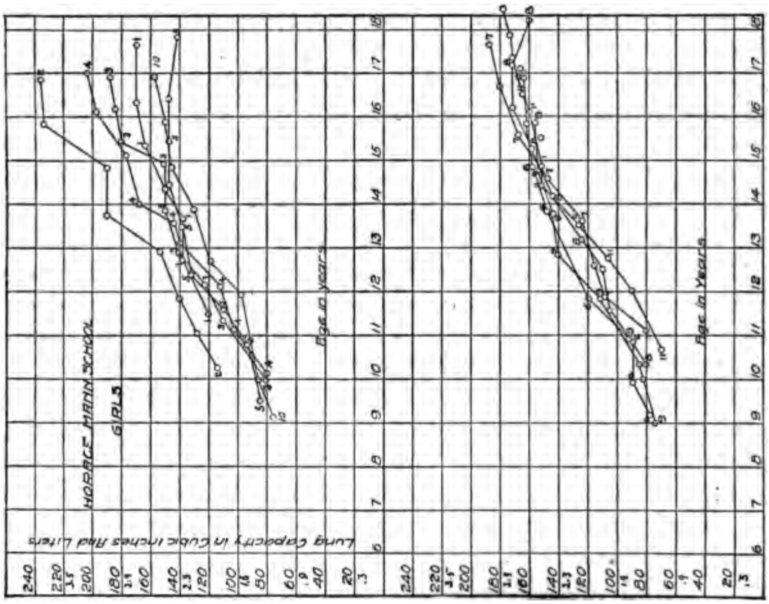

FIG. 21.—(Chart VIIb) Lung-capacity curves for Horace Mann School girls.

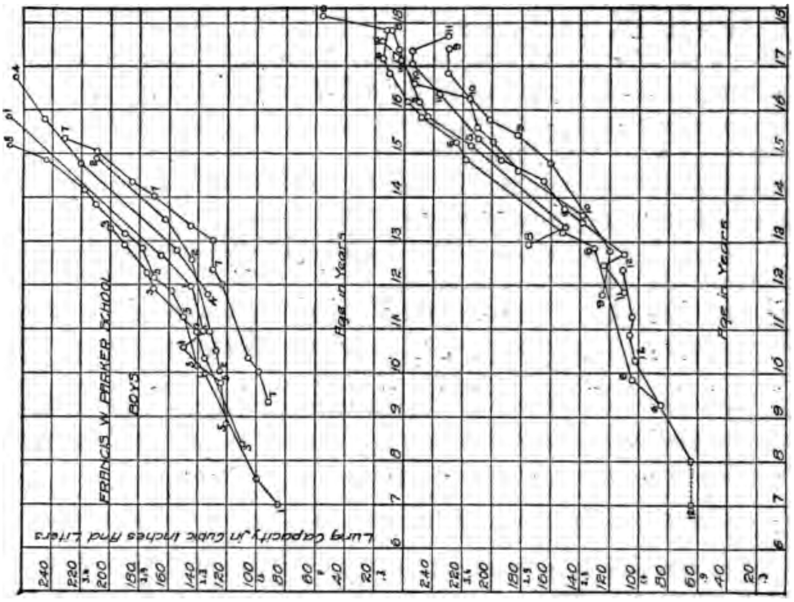

FIG. 22.—(Chart VIIIb) Lung-capacity curves for Francis W. Parker School boys.

The boys have greater lung capacity than the girls at all periods except between 13 and 14 years.

The annual increase in lung capacity is slightly less regular than that of weight, and the curves tend toward the same concave form.

The concavity of the lung-capacity curves, like those of weight, is more marked with boys than girls.

Marked arrests in height and weight are uniformly accompanied by arrest in growth of lung capacity.

There are a few cases of uniform increase in increments of growth in lung capacity during adolescence.

The boys and girls of greatest lung capacity are almost invariably those of greatest height and weight, and each frequently maintains his or her relative position within the group.

The boys and girls above and below median height differ in their periods of accelerated growth in lung capacity in a manner similar to the differences in height and weight.

9. THE RELATION OF PHYSICAL DEFECTS TO GROWTH.

It is not possible to discuss in detail in this bulletin the relations between physical defects, diseases, and nutrition, and growth in height, weight, and lung capacity, but the data, as far as available from the physicians' records, are included in order that comparisons and further conclusions may be made by those who wish to follow up these details. The aim here, as in all phases of this investigation, is to present the source material in such form that future inductive studies may be pursued by the writer or by others who wish to use the data.

In general, it may be stated that there are more marked relations between defects or diseases and growth in weight than in height, although the height is affected by conditions of long standing. For example, No. 1, Chart Ia, is the tallest individual in this group until 13 years of age, after which he gradually loses his relative position. Accelerated growth and resistance to disease go hand in hand. Adenoid growths materially affect physical development.

No. 10, Chart Ia, has the characteristic rhythms of growth in height and almost none in weight. The weight height and vital indices indicate subnormal nutrition. This is even more marked in the case of No. 14. A child may of course be short and light and still have normal growth in height and weight, providing the weight height relationship is normal.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts Ia and b.

(Those appearing in the group of 100 in Tables 21 and 22 are: 1=150; 3=147; 6=194; 7=196; 8=191 10=114; 11=170; 12=159; 13=111; 14=106.)

1. Health good at entrance; at 7 heart irregular and intermittent, cautioned with regard to exercise (note rapid growth in height and weight); anemic at 8 (note drop

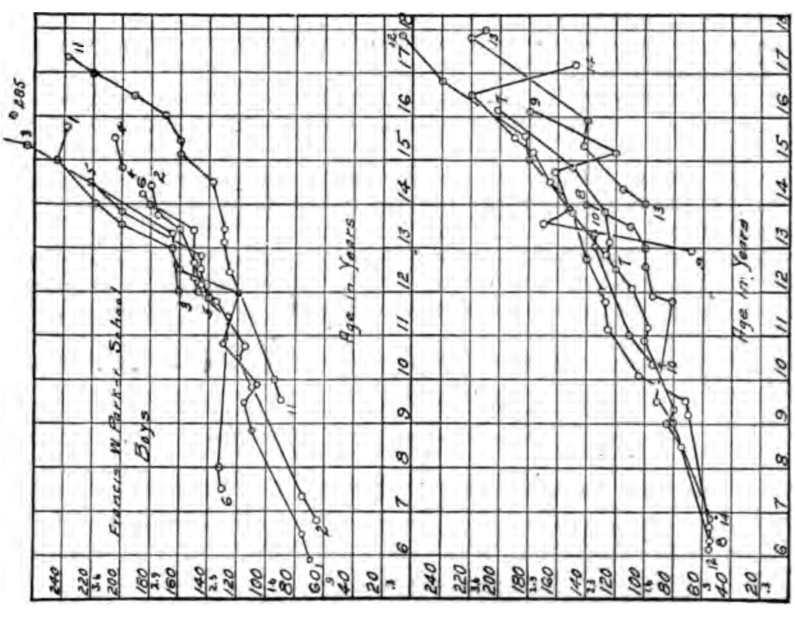

FIG. 23.—(Chart IXb) Lung capacity curves for Francis W. Parker School boys.

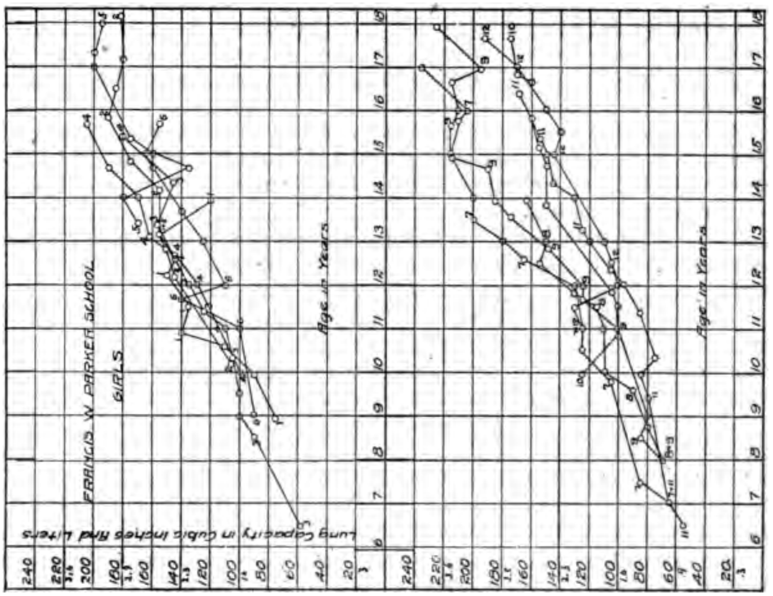

FIG. 24.—(Chart Xb) Lung capacity curves for Francis W. Parker School girls.

in weight curve); at 10 heart regular and normal; at 11 special shoes for flat feet, also corrective exercises; at 14 injured knee. Parents American.

2. During childhood had whooping cough, mumps, measles, scarlet fever, and inflammatory rheumatism; at 10½ heart was irregular and continued to remain slightly irregular. Mother American, father English.

3. Health good at entrance; slight hereditary tendency to nervousness; had measles between 6 and 7 and chicken pox and bronchial pneumonia between 7 and 8; just previous to measurements of 9 years was recovering from measles; at 10 tonsils slightly enlarged, remaining so until 11.

4. Health excellent at entrance, but had had whooping cough and measles; rhinosis at 9½ which continued until 11½ years, after which condition improved.

5. Health good at entrance, but had had measles at 3; at 5½ posture poor;[1] at 7½ posture poor; heart slightly irregular at 8; astigmatism; corrective work begun in gymnasium at 8½; bronchial cold at last measurement.

6. Condition good at entrance, but tendency to colds and had had whooping cough; at 14 condition good; shoulders round at 16; improved at 17.

7. Excellent health, but had had scarlet fever, complicated with mastoid operation; measles, chicken pox; adenoids removed (note rise in weight curve); condition good during remainder of the time. Mother American, father German.

8. Weak throat at 11; condition good at 14. Mother American, father English.

9. Health good at entrance, but had had scarlet fever, whooping cough, and malaria; at 14½ had malaria, flat feet, enlarged tonsils, and follicular conjunctivitis; at 15½ improvement; at 18 good, under occulist's care. Parents American.

10. At entrance had had measles and bronchitis; tendency to bronchitis; fair health, tires easily; poor nutrition, slight pigeon breast at 7; health better at 8, also eyes, which were weak; at 14 left eye injured.

11. Health generally good; eyes weak between 13 and 14; gave trouble between 16 and 17 Parents American.

12. At entrance had had whooping cough, chicken pox, scarlet fever, mumps; restless; at 13 had operation for appendicitis; at 15½ condition good, followed by bicycle accident.

13. Excellent health, but has had measles; nervous child; shoulders round; foreskin long, bad habits at 8; condition fair, but restless at 10; at 11 condition fair; posture poor at 13.

14. Health good on entering, but had had whooping cough; tendency to tonsillitis; at 8 had tonsils and adenoids removed; at 9 well until severe attack of tonsillitis; at 10 condition good, but foreskin inflamed; also at 11 and 12; nervous temperament; high arched palate.

[The health notes for the other individuals may be found in Section III, Statistical Material, pp. 118–124.]

10. WEIGHT-HEIGHT AND VITAL INDICES.

One of the most useful and most practical indices of growth is the weight-height coefficient, which expresses the comparative solidity or robustness of the individual, and, therefore, other things being equal, his general nutrition. The following table gives the weight-height and also the vital indices of the pupils whose heights, weights, and lung capacities are expressed by the curves given in Charts Ia and Ib to XIV, inclusive. The weight-height index is obtained by dividing weight (in kilograms) by the height (in centimeters); this gives fraction of a kilogram which the individual possesses in wei

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[1] Whooping cough between 6 and 7 (slight depression in weight).

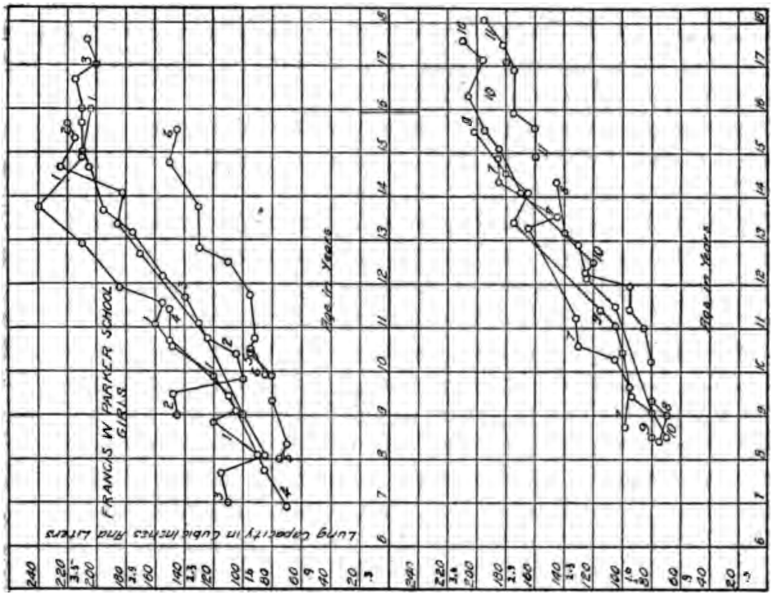

FIG. 26.—(Chart XIIb) Lung capacity curves for Francis W. Parker School girls.

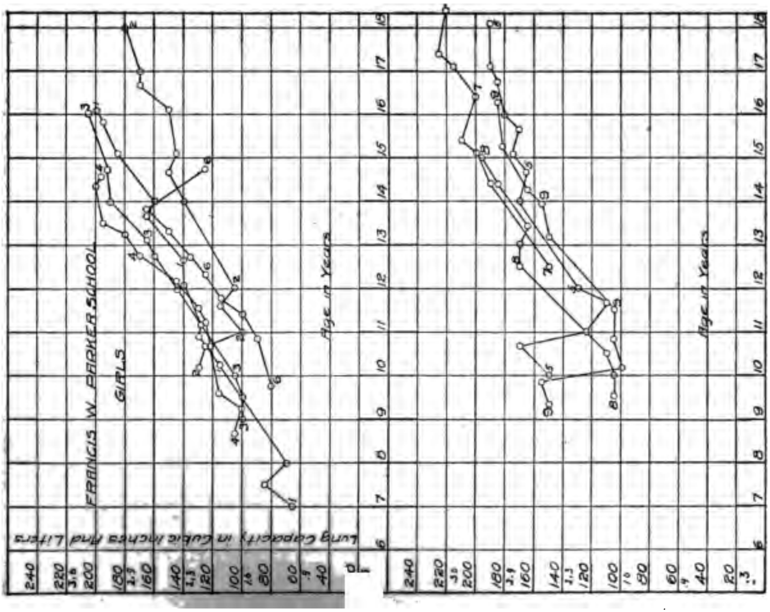

FIG. 25.—(Chart XIb) Lung capacity curves for Francis W. Parker School girls.

each centimeter of height. The vital index is obtained by dividing the lung capacity (in liters) by the weight (in kilograms); this gives the fraction of a kiloliter which the individual possesses in lung capacity for each kilogram of weight.

The numbers at the top of this table refer to the successive measurements shown by the circles in Charts Ia and Ib and indicate the age in half-year periods; the numbers at the left in the vertical column refer to the individual curves as numbered on the charts. The upper row of figures in hundredths express in each case the weight-height index; the lower row in thousandths, the vital index.

The weight-height indices increase steadily in nearly all cases from 5½ to 18 years of age, which shows that weight increases more rapidly than height. The lowest ratio in this group of boys is 0.15 at 6 years and the highest 0.40 at 17½ years of age. There is little or no apparent difference, as a rule, between the tall boys and the short boys, except that the tall individuals have high indices early. This clearly substantiates the two important conclusions previously stated that the development in height and weight, as a rule, go hand in hand, and the second conclusion that any normal physiological change in the height or weight occurs earlier for tall children. For example, if we take the index 0.23 as representing a given physiological stage of development, it will be noted that the time shifts chronologically in a fairly uniform manner between 7 and 8 years of age with No. 1 to 14½ years for No. 14.

Table 9.—*Weight-height and vital indices at ages 5½ to 17½ years for Charts Ia and Ib (pp. 38, 53)*[1].

[Figures in hundredths express weight-height index; those in thousandths the vital index.]

	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
	0.19	0.21 .058		0.25 061		0.23				0.25 .065	0.25	0.26 .072		0.27 .070		0.29 .071		0.34 .066							
									0.26 .050		.27 .055		0.28 .056		0.32 .057				0.36 .068		0.35 .076		0.37 .084		
		.20			0.22 .055	.22 .058		0.23 .060		.26 .056		.26 .062		.27 .063		.30 0.60		.32 .060							
						.17 .068		.20 .060	.22 .058		.24 .058	.23 .064	.25 .062		.28 .060		0.29 .055		.33 .061						
	.18 .057		0.18 .067		.20 .071	.20 .070	0.20 .071		.22 .064		.22 .074		.24 .076		.24 .073										
													.23	.23 .055		.26 .056		.29 .060		0.33 .061		0.37 .058		0.37 .060	
							.23			.27 .046	.27 .051		.30 .054		.31 .054		.33 .052		.37 .050		.36 .056		.40 .059		
										.22		.23 .063		.24 .064	.25 .065			.28 .064	.30 .063		.35 .057		.36 .067		0.37 .071
																	.33 .061		.32 .068		.37 .065	.36 .060			.40 .075
		.15 .049		.16 .049		.18 .068		.18 .060		.19 .060		.21 .056				.24 .054		.26 .050							
											.24		.25 .061		.25 .059	.26 .066		.28 .063		.29 .064		.27 .071		.35 .064	.37 .066
														.25 .063		.26 .061	.27 .060		.28 .063		.30 .066				.34 .068
13.					.20 .042	.21 .044		.19 .056		.20 .065		.20 .072		.21 .066		.23 .062		.23 .068		.24 .064					
14.				.15 .058		.20 .047		.22 .044				.19 .047		.19 .056		.21 .056		.22 .051		.23 .046					

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[1] The indices for the other individuals are given in Section III, Statistical Material, pp. 125–133.

[2] See Chart I *a* (p. 38) and Chart I *b*, p. 53.

The gain in lung capacity or vital index also increases with age and in general follows the tendencies just indicated for the weight-height indices.

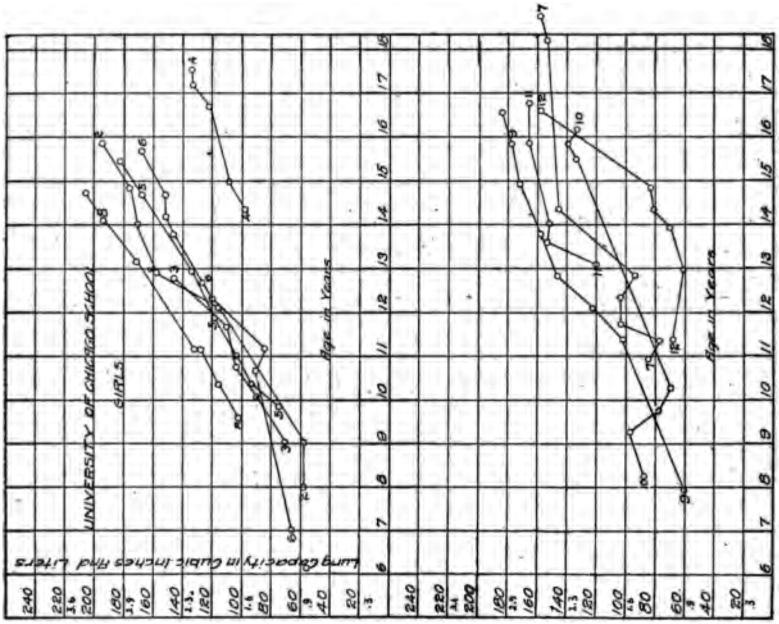

FIG. 28.—(Chart XIVb) Lung capacity curves for University of Chicago elementary and high schools.

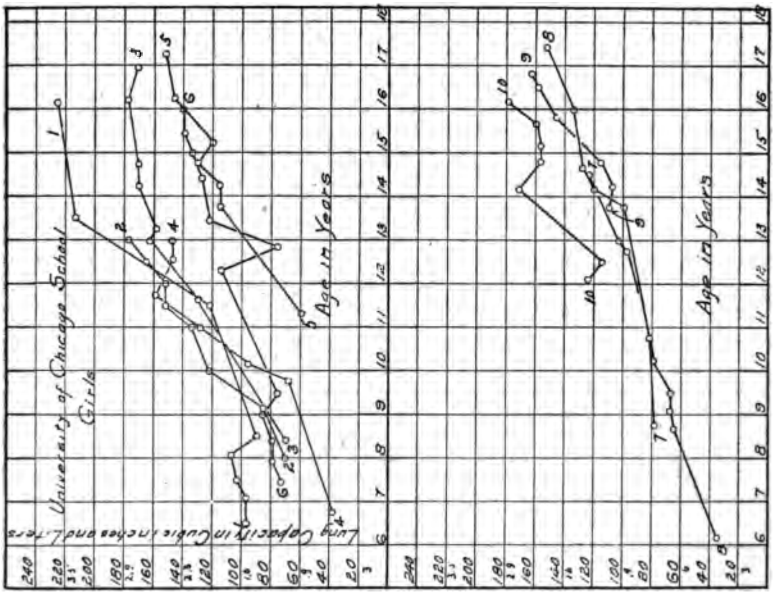

FIG. 27.—(Chart XIIIb) Lung capacity curves for University of Chicago elementary and high schools.

The following table gives the averages of all the weight-height and vital indices for the boys and the girls from the two groups of schools:

AVERAGE WEIGHT-HEIGHT INDICES.

	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
..	0.178	0.176	0.188	0.187	0.195	0.195	0.204	0.202	0.201	0.218	0.230	0.224	0.232	0.234	0.253	0.259	0.273	0.269	0.302	0.274	0.328	0.310	0.351	0.334	0.423
..	......	.185	.192	.185	.198	.192	.204	.206	.211	.223	.232	.227	.240	.246	.246	.256	.264	.222	.287	.302	.317	.323	.322	.340	.344
..	.156	.174	.187	.191	.193	.195	.208	.187	.225	.216	.226	.240	.255	.245	.274	.278	.298	.302	.310	.323	.337	.325	.342	.314	.364
..	......	.170	.163	.177	.173	.182	.180	.191	.200	.217	.206	.216	.226	.273	.254	.261	.270	.280	.293	.295	.316	.311	.318	.317	.318
..	......	.160	.200	.205	.194	.195	.188	.198	.200	.232	.224	.224	.245	.248	.243	.254	.286	.279	.252	.254	.313	.305	.312	.307	.312

AVERAGE VITAL INDICES.

Boys.																									
race Mann....	0.0516	0.0518	0.0588	0.0564	0.0588	0.0653	0.0622	0.0578	0.0629	0.0581	0.0612	0.0610	0.0616	0.0621	0.0613	0.0596	0.0613	0.0610	0.0622	0.0652	0.0639	0.0668	0.0681	0.0655	0.0730
W. Parker....	......	.0625	.0780	.0625	.0560	.0715	.0510	.0536	.0494	.0575	.0602	.0602	.0557	.0631	.0606	.0606	.0607	.0591	.0630	.0620	.0634	.0612	.0618	.0630	.0700
Girls.																									
Horace Mann....	.0500	.0390	.0463	.0434	.0837	.0498	.0520	.0507	.0567	.0530	.0532	.0538	.0533	.0531	.0542	.0548	.0539	.0530	.0539	.0526	.0535	.0548	.0539	.0580	.0535
F. W. Parker....	......	......	.0490	.0496	.0615	.0436	.0615	.0537	.0568	.0609	.0636	.0598	.0587	.0575	.0569	.0575	.0594	.0568	.0548	.0562	.0543	.0577	.0567	.0560	.0581
Chicago..........	......	.0350	.0480	.0450	.0575	.0440	.0467	.0523	.0462	.0490	.0516	.0575	.0467	.0527	.0540	.0553	.0518	.0577	.0477	.0504	.0485	.0563	.0528	.0520	.0502

It will be noted that the averages destroy the individual characteristics of the relation of the growth in weight and height, since the fluctuations due to physiological maturity counteract each other in a manner that neutralizes rhythmic tendencies. It may be observed that the weight with boys in proportion to the height increases just over 100 per cent from 5½ to 17½ years; the increase with the girls is slightly less than that of the boys. It is very difficult to observe nodes in the relationship of the two aspects of growth, but apparently there is an increase at 10½ and another at 14½ years of age. This substantiates the previous conclusion that the pubescent acceleration in weight precedes that of height, and that weight continues to increase much more rapidly than height after 14½ years for boys. These two nodes may be noted to appear approximately at 10 and 13½ for the girls.

There is less increase in relative growth in weight in proportion to lung capacity than in the case of height. For boys the increase from 5½ to 17½ is from 30 to 40 per cent when averages are taken, and for girls there is less increase. These average results, as in the case of the weight indices, are not representative of individual development, since they are averages.

11. THE CORRELATION OF GROWTH IN HEIGHT AND WEIGHT TO SEXUAL DEVELOPMENT.

Selecting the individual growth curves of the girls whose first menstruation has been carefully recorded in years, months, and days, and placing them in a chart (No. XVa), it is at once apparent there is a direct correlation between physiological age as evidenced by height and weight and the advent of menstrual functions. The tallest and heaviest girl (No. 1, Chart IVa) in the group from the three schools began her pubescent acceleration in height with the usual accompanying changes in weight at about 10 years. This is unusually early, but is accounted for by the previously established conclusion that her height, weight, and healthy constitution indicated an early physiological development. As indicated by the cross line in the chart, the menses appeared when she reached 12 years of age.

The second and third girls (No. 3, Chart VIa, and No. 1, Chart Va) are each tall and heavy. The second, or heavier one, had her first menstruation as early as 11 years, and the former at 11½. Both of these girls were apparently in good health at the time; both had previously had adenoids removed.

The fourth girl (No. 3, Chart VIa), who is anemic and neither as tall nor as heavy as either of the others, but above median
menstruation at 13 years 3 months. The fifth girl
XIIIa), who is above median height and weight, bega
at 12 years 5 months; the sixth (N
a), also

height, at 13 years 3 months; the seventh (No. 4, XIIIa) at 13 years 8 months; the eighth (No. 5, XIIIa) at 15 years 3 months 17 days; the ninth (No. 12, XIVa) at 14 years; the tenth (No. 6, XIVa) at 13 years 9 months; the eleventh (No. 9, XIVa) at 13 years 9 months; the twelfth (No. 9, XIIIa) at 16 years 7 months; the thirteenth (No. 10, IVa) at 16 years; the fourteenth (No. 14, XIVa) at 15 years.

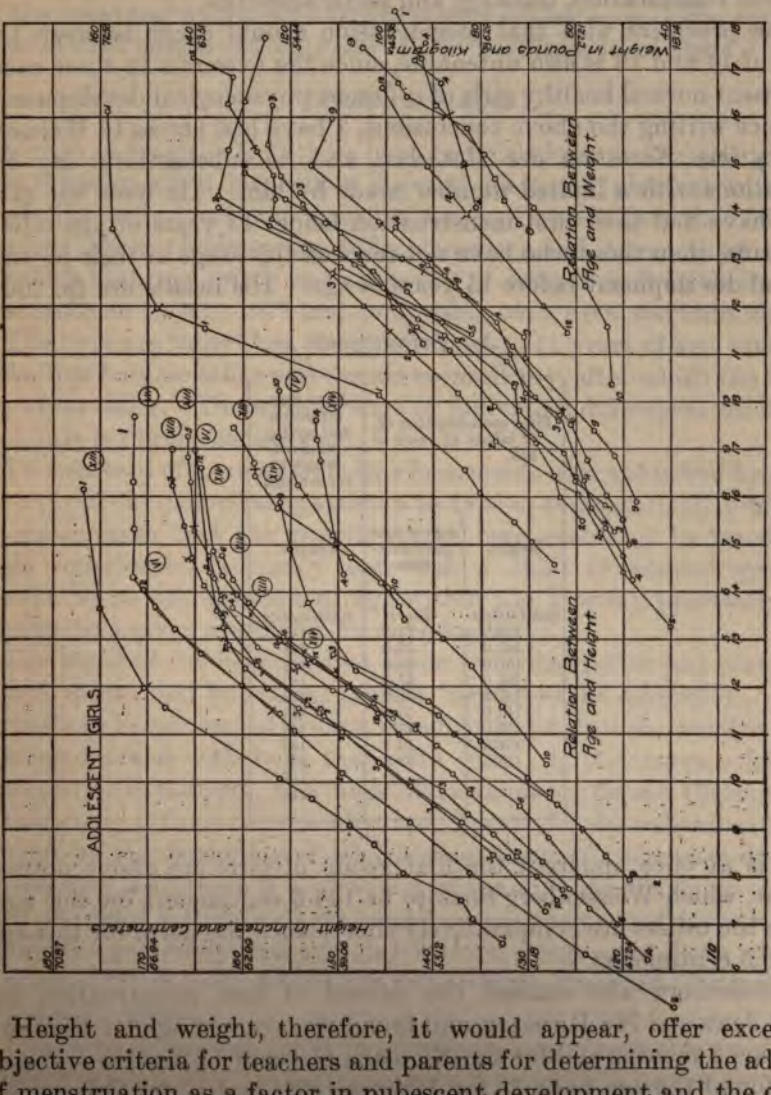

FIG. 29.—(Chart XVa) Periods of maturation for girls.

Height and weight, therefore, it would appear, offer excellent objective criteria for teachers and parents for determining the advent of menstruation as a factor in pubescent development and the onset of maturity. If the girl is tall, healthy, and well nourished, this physical stage may be reached as early as 11 years in a normal girl; if tall, but under weight, it may be del [illegible]; if very short and markedly light, it may be delayed until 16 years of age.

These conditions have wide educational application both in physical training and school work. They emphasize the fact that the smaller child should be treated as a younger person who has not had the physical development and the accompanying mental disturbances and experiences which would seem to be indicated by her chronological age in years, and which, too often, has been used as a basis of classification, training, and social activities.

The prevalent idea that menstruation should occur between the ages of 14 and 16 is also untenable, since the extremes in these cases represent normal healthy girls of different physiological development.

Since writing the above conclusions, I have had access to Weissenberg's *Das Wachstum des Menschen*, and he substantiates my observations with a limited number made by him. He finds the girls who have had their first menstruation before 13 years of age taller, as a rule, than those who have not reached this stage in their physiological development before 15 years of age. His results are (p. 200):

Age of menstruation.

First menstruation on or before 13 years of age.		First menstruation not having occurred before 15 years of age.
Height.	Age at first menstruation.	Height.
Centimeters.	*Years.*	*Centimeters.*
152.0	13.0	142
144.0	12.0	148
157.0	11.0	148
154.0	12.0	150
157.0	11.0	148
140.0	13.0	145
147.0	13.0	158
154.5	12.5	149
145.5	12.5	151
....	....	151
....	....	148

It is at once apparent the first group of girls are above normal height, which Weissenberg finds to be 144.5 centimeters for this age, while the others are comparatively short, since the norm for this age is 150.5 centimeters.

Weissenberg also studied the advent of first menstruation for 1,273 Jews and 768 Russians, and found the average age for the Jews 14 years 2 months and for the Russians 14 years 11 months. Jamasaki found the age to be 15 for Japanese girls and 17 for Chinese, on the average.

These differences in ages are no doubt greatly influenced by racial and climatic conditions, but the conclusions of this investigation, so far as I am able to determine, hold true for individuals within a race and under similar environmental conditions, i. e., the taller, heavier girls, with extensive lung capacity, mature physiologically earlier than those below the median or average in these respects.

Other signs or criteria of physiological age are the early appearance of the teeth and the development of the bones of the wrist, changes of the voice and pubescent changes during adolescence. The appearance of first menstruation is one of the most significant signs.

12. CONCLUSIONS.

Growth in height.—That these boys and girls form a select group and that school medical inspection, directed play, and physical training are important educational agencies is shown by the fact that on the average these children are taller, heavier, and have better lung capacity than any group in a series of 112, extending from Quetelet's first study in 1836 to 1913 and comprising over 1,000,000 individuals.

The boys are taller than the girls from 6 to 11 years of age, and the girls then become taller and remain so until 14½, after which the boys are again taller. The widest range of individual differences for boys and girls is during adolescence.

The per cent of increase in height increments over the initial heights for a given chronological age from 6 to 18 is so comparatively uniform in many cases that the growth curves may enable us to prophesy with considerable accuracy how tall a child of normal growth should be at any subsequent age within the interim, providing his relation to a given median or norm be known.

The trend of the height curve, aside from the period just previous to the accelerated pubescent growth, tends toward convexity. The decrease in increments of growth in height just before the acceleration is more marked with boys than with girls. If the increase before adolescence is uniform, this uniformity tends to persist throughout adolescence; if there is unusually rapid growth for the individual from 7 years to the beginning of adolescence, there is a decrease during adolescence, and there is a reversion of the common rhythmic order.

Of the boys and girls whose height curves are plotted for the preadolescent and adolescent ages, a few show a regular uniform rate of increase at pubescence, more show an accelerated rate, and fewer show a decrease in gain.

The cases of marked arrest in growth in height with this group of children occur during the early adolescent period and persist through the period.

Growth in height is affected by the inception and removal of adenoids, but the common children's diseases apparently have little effect on incre[illegible]n stature.

The average increments of growth of those above and below the median height, the individual increments of growth in the four tables of boys and girls, the individual growth curves, the advent of maturity with the girls, show that the children above median height between the chronological ages of 6 and 18 grow in stature and in physiological maturity in advance of those below the median height, and they may be physiologically from 1 to 4 or even 5 years older than those below the median height. Those above the median height have their characteristic pubescent changes and accelerations earlier than those below; there is a relative shifting of the accelerated period according to the individual's relative height.

For the girls included there is a direct correlation between the advent of first menstruation and different heights of the individuals. The taller girls mature earlier than the ones below the median.

Growth in weight.—The boys are heavier than the girls from 6 to 12 years of age, and the girls then become heavier and remain so until 16, after which the boys surpass them.

In many cases it would be possible to prophesy the approximate weight at any later age within the interim from 6 to 18 years of age. However, the weight curves show more marked individual variations and fluctuations than the height and in some cases show actual loss of weight.

The trend of the weight curves, differing from the height curves, is toward concavity, with more marked concavity (or loss of increments of gain between 8 and 13 years) for boys than girls.

The weight curves are characterized by a period of rapid acceleration during adolescence, except in cases of marked arrest, which are usually accompanied by marked arrest in growth in height. There are very few curves of a uniform increment of growth during adolescence.

Marked arrests of growth in weight for these children, like those of height, occur during the adolescent period.

Growth in weight is materially affected by the inception and removal of adenoids and the inception of or recovery from disease.

The heavier boys and girls are the taller boys and girls, and there is a fair parallelism between the relative rank in height of a boy or girl and his or her relative weight within a group.

The boys and girls below median height have their periods of rapid pubescent acceleration in weight later than those above, since the same general principles of physiological age hold for weight as for height as a rule.

Growth in lung capacity.—The boys have greater lung
the average than the girls for all periods except betwe
years of age.

The annual increase in lung capacity is slightly less regular than that of weight, and the curves tend toward the same concave form. The individual fluctuations are more like those of weight than height.

The concavity of the lung capacity curves, like those of weight, is more marked with boys than girls.

Marked arrests in height and weight are uniformly accompanied by arrest in growth of lung capacity.

There are a few cases of uniform increase in increments of growth in lung capacity during adolescence.

Growth in lung capacity is materially affected by the inception of and recovery from disease.

The boys and girls with greatest lung capacity are almost invariably those of greatest height and weight, and each maintains his or her relative position within the group as a rule.

The boys and girls above and below median height differ in their periods of accelerated growth in lung capacity in a manner similar to the differences in height and weight.

(B) AGE, GRADE, AND SCHOOL STANDING.

1. CURRICULA AND METHODS OF GRADING.

The subjects of instruction in the Horace Mann School, in the elementary work, include arithmetic, art, composition, French, geography, grammar, history, literature, manual training, nature study, penmanship, reading, science, and spelling; and the high-school subjects are algebra, biology, chemistry, Cicero, civics, English, French, German, geometry, history, Latin prose, manual training, physics, trigonometry, and Virgil. The Francis W. Parker School includes English, French, German, handwork, history, mathematics, reading, science, spelling in the elementary school, and Latin in addition in the high school. Both schools have 12 grades above the kindergarten. The Horace Mann School marks begin in the third grade and the Francis W. Parker School marks as low, in some instances, as the first grade.

With the exception of a very few individuals the school marks were recorded in the letters A, B, C, D, E, and F, and for these are substituted the following equivalents given on the report card: A=97½; B=90; C=80; D=72½; E=65; F=30. In the few instances where the numbers 1, 2, 3, 4, and 5 were used the following equivalents, recommended by the head of the school, are used: 1=95; 2=80; 3=50; 4=30.

The record card is shown on the next page. The marks for music and application are not included in this study.

[Record card.]

HORACE MANN ELEMENTARY SCHOOL.

Name.. Grade.......................

190 -191	English				Mathematics	Nature study	Geography	History	Penmanship	Manual training	Art	Music	Application	No. of absences	No. of tardinesses	Remarks
	Reading and literature	Spelling	Grammar	Composition												
Dec. 1																
Feb. 1																
Apr. 1																
June 1																

[Reverse side.]

A—95-100. **B**—85-95. **C**—75-85. **D**—70-75. **E**—60-70. **F**—0-60.

In order that a pupil may be promoted he must secure the mark **D** or above on his last report, and on at least two others, with no mark below **E**.

Parents or guardians are earnestly requested to examine this report, sign below and return.

Principal.

Dec. 1	
Feb. 1	
Apr. 1	
June 1	

2. THE DATA.

The average school mark for the 42 Horace Mann School boys is 81.9 per cent and is based on 8,625 final marks; the average mark for the 46 Horace Mann School girls is 85.9 per cent, based on 10,063 final marks; the average mark for the 26 Francis W. Parker School boys is 77.7 per cent, based on 1,601 final marks; and the average mark for the 21 Francis W. Parker School girls is 80.9 per cent, based on 1,393 final marks. There are fewer subjects included in the Francis W. Parker reports, and the marks reported are yearly marks, in place of quarterly marks. This, however, should not make much material difference in the results, since the teachers computed their own term averages. The study thus includes 10,226 final term marks for 68 boys and 11,456 final term marks for 67 girls, or 21,682 final term marks for 135 individuals. No marks for a longer period than four years were available from the University of Chicago elementary and high schools, and therefore they were omitted.

3. METHODS OF TABULATION.

The following table gives the average school standing, the number of marks considered, and the grades for each year for the 14 individuals whose growth curves in height, weight, and lung capacity are plotted in Chart Ic. The Arabic numbers from 1 to 14, inclusive, refer to the number of the individual curves in the chart; the ages in years and months refer to the individual's age in June, when the first average school standing was computed, and all the subsequent average marks are for yearly intervals from this age; the average per cent is the average of all the subjects for the four terms for each year from September to June; the number of cases includes the number of marks giving the average mark for each subject for the four terms; the small figures above and to the right of the averages indicate the school grade, the high-school work beginning at the eighth grade unless otherwise indicated. The general averages and total cases are for the entire scholastic life included in this study. The 10 additional tables which follow are uniform in construction with Table 11.

The marks for No. 1 begin at 10 years 9 months of age in the fourth grade, with a yearly average of 81 per cent for 37 marks. One year later this boy advanced to the fifth grade and received an average of 82 per cent for 44 term marks, and so on until the eighth grade was completed. The final average school standing for this first boy, based on 187 marks, is 85 per cent.

The final scholastic standing of No. 2 is 80 per cent, based on 252 marks. This boy was absent from school in his fourteenth year, but returned and continued the work with the class the following year, and graduated at 18 years. It should be noted that No. 9 was absent from school during the fourteenth and No. 12 during the seventeenth year, which delayed their advance to the next grade for one year.

It is important when interpreting these tables to keep in mind that the averages in the elementary grades are based on a larger number of subjects than those in the higher grades, and that in some instances where the number of marks is small the child was absent for part of the year, as indicated in the footnote. Assuming as a basis for normal progress that a child of 12 years of age should be in the sixth grade and one 16 years of age in the tenth grade, it will be noted that Nos. 1 and 14 are retarded one year; Nos. 11 and 13, two years; and No. 9 becomes retarded one year at 14, and No. 12 one year at 17. Nos. 4, 5, 6, and 10 are one year in advance of their grade. While the chronological age is not the most rational basis of grading, judging from what has been learned from the previous data included in this investigation, it is the basis on which these schools have in the main been graded, where no systematic owances were [illegible] the physiological age or for differences [illegible] would appear that such a standard is [illegible] dicated by their curricula and methods [illegible] tion is given to individual differ-

TABLE 11.—*School standing (for Chart Ic. Horace Mann boys—Average mark, grade, age, and number of cases).*[1]

No. of curve.	Age in years and months.[2]	Age in years.																								General average.	Total cases.
		8		9		10		11		12		13		14		15		16		17		18		19		20			
		Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.		
1	10-9							81^{4}	37	82^{5}	44	91^{6}	43	84^{7}	43	85^{8}	20											85	187
2	10-2					85^{4}	37	83^{5}	40	86^{6}	39	77^{7}	48			80^{9}	28	79^{10}	20	75^{11}	24	75^{12}	16					80	252
3	8-6			84^{3}	39	89^{4}	37	87^{5}	44	87^{6}	48	82^{7}	42	78^{8}	24	84^{8}	20											84	254
4	9-3			85^{4}	41	85^{5}	47	90^{6}	22	89^{7}	47	80^{8}	28	75^{9}	25	74^{10}	24	67^{11}	6									81	240
5	8-0	82^{3}	40	80^{4}	39	83^{5}	40	81^{6}	43																			82	162
6	10-6							84^{6}	24	74^{7}	44	66^{8}	16	73^{9}	16	73^{10}	12	67^{11}	20	71^{12}	28	65^{12}	27					72	187
7	10-2					82^{4}	36	88^{5}	40	84^{6}	39	86^{7}	48	86^{8}	20	81^{9}	20	86^{10}	23	83^{11}	17							85	243
8	11-2							88^{5}	48	87^{6}	43	76^{7}	41	77^{8}	24	80^{9}	24	78^{10}	16	73^{11}	16	76^{12}	16					79	228
9	12-8													85^{7}	47	82^{8}	28	70^{9}	15	66^{10}	24	57^{12}	20	78^{12}	18			73	152
10	8-5	88^{3}	16	78^{4}	36	78^{5}	44	82^{6}	44	78^{7}	43	76^{8}	20															80	203
11	10-9							90^{3}	40	87^{4}	26	92^{5}	44	90^{6}	43	89^{7}	48	83^{9}	27	83^{9}	16	80^{10}	20	66^{11}	18	74^{12}	24	83	306
12	13-2											85^{7}	21	84^{8}	20	87^{9}	24	85^{10}	28			78^{11}	24	86^{12}	20			84	93
13	9-9					79^{3}	29	80^{3}	16	75^{4}	38	72^{5}	44	83^{6}	43	82^{7}	43	78^{8}	24									78	237
14	10-5							84^{4}	38	81^{5}	24	87^{6}	45	87^{7}	38	78^{8}	20	75^{9}	18									82	183

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[1] The tables for Charts IIc to XIc may be found in Section III, Statistical Material, pp. 134–138.

[2] Age when marks began.

SCHOOL PROGRESS IN THE HORACE MANN SCHOOL.

The average mark is 81.9 for all the Horace Mann School boys included in the tables, and the curves which follow express the individual averages in the table. This average is based on 8,625 final marks for this group of 42 boys. The median, or middlemost mark, for the group falls between 81 and 82 per cent, and therefore the average may be assumed as a norm for a basis of comparison with the height, weight, and lung capacity norms. The grade norm has been established on the basis of age and grade, assuming a boy of 12 years of age should be in the sixth grade and a boy of 16 years of age should be in the tenth grade. The two variables in the distribution of marks and grades make it extremely difficult to establish one norm of school progress. This norm may be illustrated best perhaps through graphs, and a series of charts accompanies each of the tables on age, grade, and school standing.

It is at once apparent that there are 5 boys in Table 11, Ic, who are above the average school mark, or norm (81–82 per cent), for their group, and all of these boys except one are retarded by grade. There are 6 boys below the norm, and the 3 who were irregular in attendance are retarded by grade. In Table 24, IIc, there are 6 boys above the norm in mark; 2 of these are retarded by grade and 1 accelerated by grade. In the second group 4 boys fall below 81 per cent and 3 are retarded by grade and 1 accelerated by grade. The irregular attendance is equally distributed between those above and those below normal mark and normal grade. In the third group (Table 24, IIIc) 3 boys are above the average or normal mark, and 1 of these is accelerated by grade. Eight boys are below the norm in mark, and 3 of these are retarded by grade.

Among the Horace Mann School girls the marks are much higher; the median and average both lying between 84 and 85 per cent. In the first group (Table 24, IVc) there are 3 girls above the norm in mark and these are in normal grade. There are 4 below the norm in mark, and 2 of these are retarded by grade and 1 accelerated two grades. In the second group (Table 24, Vc) 3 girls are above the norm in mark, and 2 of these are retarded by grade; there are 8 below the norm, and 2 of these are retarded by grade and 2 accelerated by grade. In the third group (Table 24, VIc) there are 4 girls above the norm in mark and 7 below the norm, of whom 3 are retarded by grade. The last group of Horace Mann girls (Table 24, VIIc) contains 3 above the norm, of whom 2 are retarded by grade and 2 below the norm who are also retarded by gr[illegible]

There is a higher av[illegible] nd by mark for the girls than 'or the boys, and the [illegible] ndance among the girls, [illegible] ch has a retard [illegible] de and mark when [illegible] red with the [illegible] is irregular.

THE FRANCIS W. PARKER SCHOOL.

The average marks for the Parker School are below those of the Horace Mann for both boys and girls. In the first group of boys (Table 24, VIIIc) there are 5 boys above the norm (77–78 per cent), and 1 of these is accelerated by grade. There are 5 below the norm in mark, and 2 are retarded by grade. In the second group (Table 24, IXc) 10 boys are above the norm in mark, and 2 of these are retarded by grade. There are in this group 4 below the norm in mark, and 1 is accelerated by grade and 2 are retarded by grade.

The average mark of the girls for this school is 80.9 per cent, and the median is close to this. In the first group (Table 24, Xc) 8 girls are above the median in marks, and 3 of these are retarded by grade. Among the 3 below the norm in mark, 1 is retarded by grade. In the second group (Table 24, IIc) 5 are above the norm in mark, and 4 of these are accelerated by grade. Of the 4 below the norm in mark, 3 are retarded by grade.

Notes on the school standing of individuals whose marks and grades appear in Table 11 and Chart Ic.

1. Left school at the end of first year of high school.
2. Out of school one year and returned in second year of high school; remained four years with low marks; graduated.
3. Good work in elementary school; conditioned in Latin and French first year of high school (eighth grade); did not take full work second year and withdrew at end of term.
4. Out of school first two terms in sixth grade; conditioned in Latin and German during ninth; promoted to tenth; absent much in second term of eleventh; withdrew.
6. Entered beginning of third term in sixth grade; conditioned in arithmetic, grammar, French, during seventh; in biology during eighth; in Latin during ninth; in English during tenth; in Latin, French, chemistry, geometry, during eleventh; graduated after two years in twelfth.
7. Graduated.
8. Conditioned in algebra and French during ninth grade; in algebra in eleventh; graduated from twelfth.
9. Conditioned in Latin during eighth grade; in English and Greek during ninth; failed to graduate.
10. Entered third grade but did not take full work; inattentive during seventh; withdrew at end of eighth.
11. Absent during fourth term of fourth grade; conditioned in Latin, chemistry, algebra, and geometry after much absence during third term of eleventh; graduated at end of twelfth.
12. Entered seventh grade but extended absence during second and third terms; withdrew from school for one year at end of tenth; conditioned in Latin during eleventh; graduated.
13. Repeated part of third-grade work; conditioned in arithmetic during fourth; in English during fifth; improving steadily; still in school.
14. Absent during third and fourth terms of fifth grade; conditioned in E history during ninth; still in school.

[The notes on school standing for the other individ and III. Statistical material, pp. 139–142.]

4. CHARTS OF SCHOOL STANDING.

Expressing these tables in school standing in graphic form where 20 millimeters in the horizontal equals one year in age and 30 millimeters in the vertical equals one school grade, the two variables, age

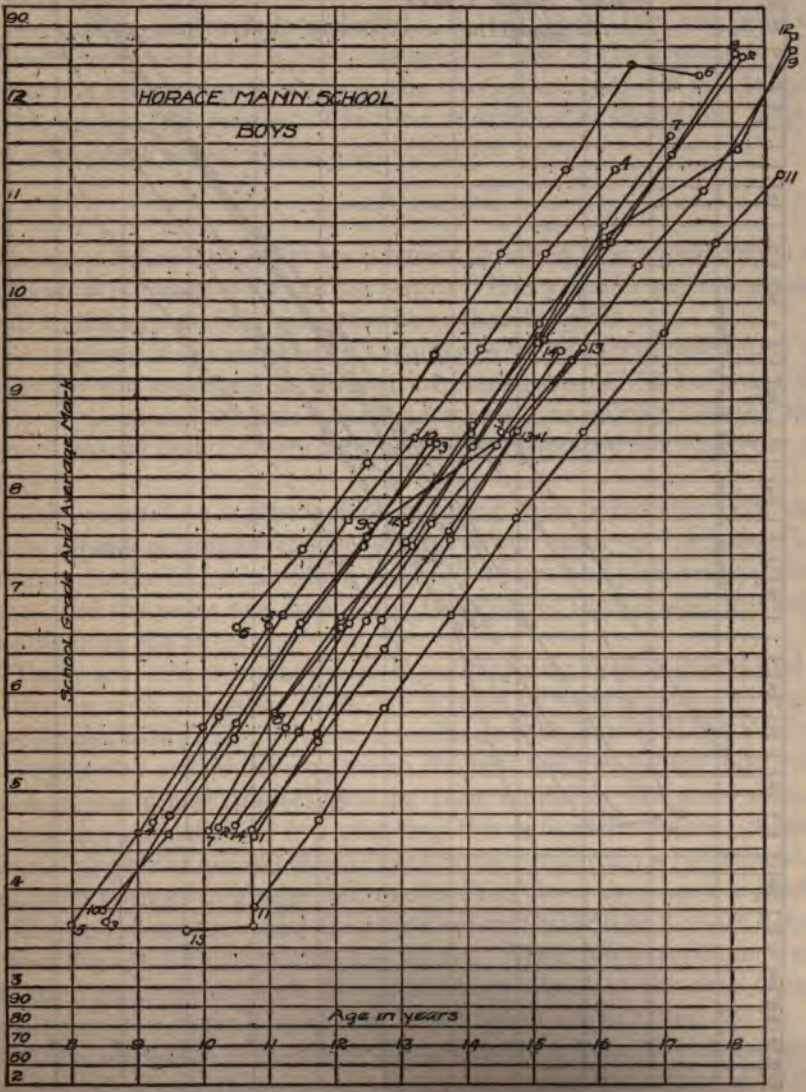

FIG. 30.—(Chart Ic) School-standing curves for Horace Mann School boys.

and school grade, may be expressed in the form of a continuous line. A third variable, or the average mark [illegible] each grade, may also be expressed, assuming the first 6 millimeters [illegible] the vertical within a grade to represent a standing between [illegible] 60 per cent, the second

6 millimeters, between 60 and 70 per cent; the third, between 70 and 80 per cent; the fourth, between 80 and 90 per cent; and the fifth,

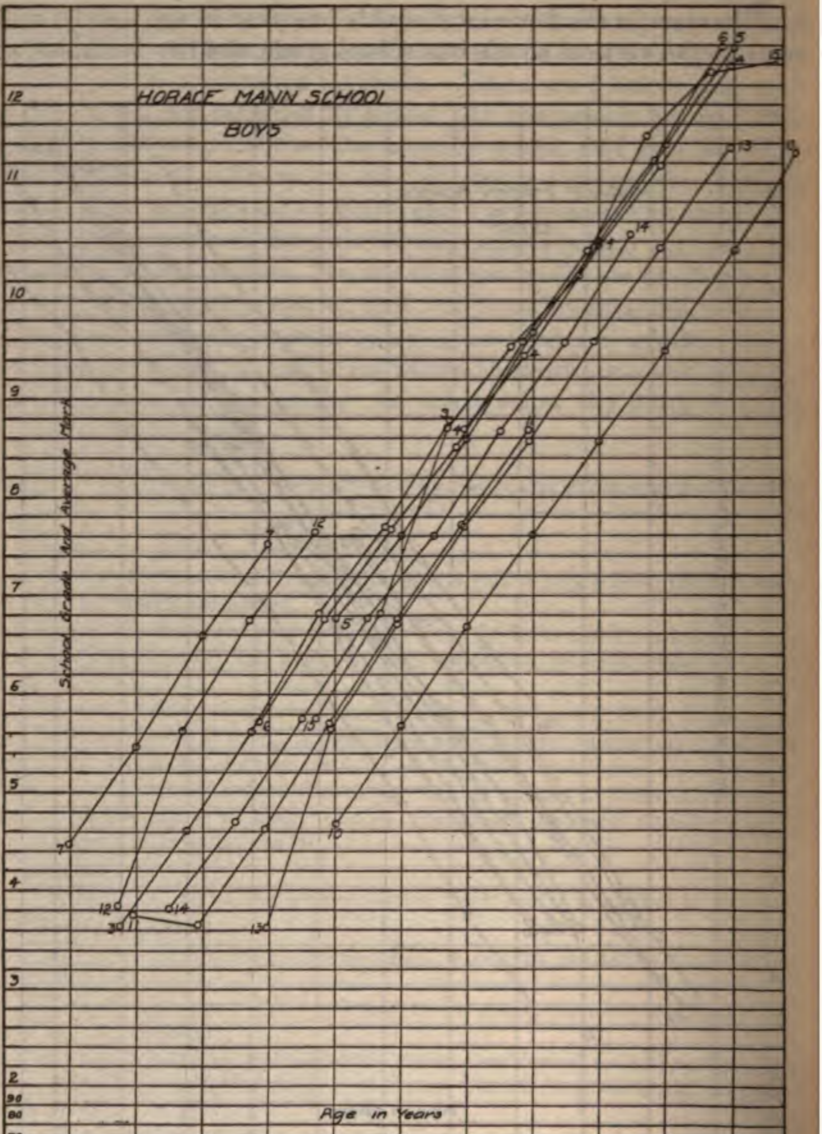

FIG. 31.—(Chart IIc) School-standing curves for Horace Mann School boys.

between 90 and 100 per cent. Thus it will be noted in the chart that the uppermost curve represents the most precocious child and the lowest curve the most retarded from standpoint of age and grade.

No. 6 is the most precocious in Chart Ic from the standpoint of age until he reaches 16½ years, and No. 11 the most retarded throughout his school life. On the contrary, comparing the average marks within the grade, No. 11 has higher marks than No. 6, as may be seen by noting the height of the circles in each grade.

It is at once apparent that 3 of these 14 boys in the first group lost a grade during the periods included. In two cases this was due to absence from school for a year, in the other case to the gradual lowering of the average mark of a boy who was being promoted in advance of his age on low grades. The nine additional charts which follow are uniform in construction with Chart Ic.

5. CONCLUSIONS.

In these schools where there is careful grading, the widest range of individual differences for the 135 pupils is four years in any one grade, with uniformly a wider range for boys than for girls.

If 12 years of age is taken as normal age for the sixth grade and 16 years for the tenth grade, there are in this group of 58 boys and 57 girls 27 boys and 26 girls retarded for one year or more during the school course and 13 boys and 11 girls accelerated for one year or more.

Girls maintain a higher school standing than boys; there are also more repeaters among the boys; and fewer cases of "skipping" a grade. In the fourth and fifth grades the boys and girls are approximately of the same age, but in the last year of high school the boys are older on the average.

There are only 9 instances of boys dropping back a grade and 4 instances with the girls; there are 4 cases of boys skipping a grade and 8 cases with girls. These are confined to the Horace Mann School.

Pupils who are relatively poor in the first few grades are relatively poor in the upper grades; that is, poor marks in the early school course are indicative of low standing throughout the school course. Boys and girls of normal school age or under maintain a better school standing both as to grades and marks than those over age for grade.

The age of entrance and the grade entered after 6 or 7 years determines the age for completing the school. With few exceptions these children progress through the elementary school at the rate of one grade per year, regardless of the chronological age at entrance.

There are waves or nodes in the marks from year to year for each individual, the most prominent drops coming at the entrance to the high school and in the fourth and fifth grades.

(C) THE RELATION OF PHYSICAL GROWTH TO SCHOOL STANDING.

1. SCHOOL STANDING AND GROWTH IN TWO ELEMENTARY SCHOOLS.

We now see the fundamental questions are: How do children progress through school? How do children mature physiologically during their school life? What is the relation between these two aspects of development when both are studied consecutively throughout the elementary school?

It must be recognized that since we are investigating the school standing age and since promotions and school efficiency are based on marks, these records must be taken at their face value, because they represent school practice and because they offer tangible criteria of the efficiency of the individuals of the school.

Each school has 12 grades above the kindergarten. The departmental method of instruction is more or less in vogue in all grades; and the same teachers, in some instances, have marked the pupils in their respective studies for several years. The teachers are among the best trained in America and the pupils are given a great deal of individual attention.

A more careful study of individual marks reveals that there are waves or nodes in the marks from year to year for each individual. The two most prominent drops are at the entrance of high school and in the fourth and fifth grades. The lower averages are most marked in the transition to the high-school grades, where the number of subjects also decreases. In these schools the best marks are found in the sixth and seventh grades for boys and girls, and during these grades the greatest number of subjects are included.

TABLE 12a.—*Average marks and average number of subjects for pupils in the elementary school, based on quarterly term marks.*

HORACE MANN SCHOOL.

	Grades.																Total average elementary school.
	1		2		3		4		5		6		7		8		
	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	
Boys....	......	...	......	....	84.6	34	81.9	36	82.6	55	85.5	46	83.3	44	80.3	22	83.7
Girls.....	......	...	......	....	90.0	34	87.2	39	85.0	45	89.0	44	87.4	46	85.4	22	87.9

FRANCIS W. PARKER SCHOOL.

	1		2		3		4		5		6		7		8	
	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.	Average marks.	Subjects.
Boys....	75.5	8	71.4	8	74.0	8	75.0	8	75.0	8	76.2	8	77.6	8	77.3	8
Girls.....	84.8	8	89.8	8	84.2	8	83.9	8	84.0	8	84.9	8	84.5	8	83.4	8

The fact that marks are lower during the fourth and fifth g
significant. The reasons for the lower averages may b

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from each pupil's marks in each subject for each period and from the growth curves.

The variability of marks and the changing distribution in their ranking show that many pupils are not doing the kind of work given them in some subjects during these intermediate grades. What these subjects are for the Horace Mann School, and how they change from grade to grade, is shown in the following table, which gives the summaries of the marks that are very poor, poor, or only fair.

TABLE 12b.—*Number of pupils in each study in the various grades doing only fair or mediocre work.*

BOYS.

Grades, and number of pupils in grade.	III-19.	IV-30.	V-39.	VI-38.	VII-38.
Art	7	10	11	4	7
Composition	6	15	9	7	14
French and German	0	0	0	0	12
Grammar	0	2	0	8	19
Geography	1	8	1	7	9
History	8	4	5	5	11
Language	2	0	5	0	0
Literature	2	7	3	1	0
Manual training	7	10	11	1	0
Mathematics	10	20	10	10	17
Nature study	1	0	2	0	5
Penmanship	5	19	20	13	14
Reading	3	7	7	2	5
Spelling	6	13	10	6	13

GIRLS.

Grades, and number of pupils in grade.	III-27.	IV-36.	V-37.	VI-38.	VII-38.
Art	4	8	11	1	2
Composition	3	4	6	1	3
French and German	0	0	0	0	8
Grammar	0	2	3	0	0
Geography	1	11	7	0	8
History	0	8	5	1	9
Literature	1	3	5	1	4
Manual training	2	4	6	1	3
Mathematics	0	12	12	5	10
Nature study	2	0	5	1	3
Penmanship	1	9	7	2	0
Reading	6	10	5	0	2
Spelling	4	5	6	1	3

The very poor marks for the boys are: In the third grade, history 7, arithmetic 3, spelling 3; in the fourth grade, mathematics 10, penmanship 9, spelling 6; in the fifth grade, penmanship 9, mathematics 4, history 4; in the sixth grade, history 3, mathematics 3, penmanship 2; in the seventh grade, spelling 7, penmanship 6, mathematics 5.

For the girls the very poor marks are: In the third grade, spelling 2; in the fourth grade, mathematics 9, penmanship 5, geography 4; in the fifth grade, art 5, history 4, geography 2; in the sixth grade mathematics 1; in the seventh grade, geography 4, history 4, French and German 4.

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Among these boys and girls, those of normal school age or younger maintain a better school standing, both as to grade and mark, than those over age for the grade. This is important; why do these pupils of normal school age or under maintain this better school standing? A careful study of sustained absences does not account for the conditions, though absence and a study of diseases and accidents aid somewhat. The explanation lies in the advanced maturity of the pupils. Since we have no recourse to consecutive mental tests throughout the elementary school life of these pupils, but since we have recourse to their consecutive physical measurements in height, weight, and lung capacity, the problem resolves itself into finding the relation between growth and school standing. The previous study of these individuals, together with their weight, height, and vital indices, diseases, and physiological changes, shows that the taller, heavier children mature physiologically in advance of the shorter, lighter ones; and a study of ages, grades, and the marks of the boys shows that those above the average height of the group, i. e., those whose physiological age is accelerated, complete the last grade of the elementary school at 12 years $9\frac{5}{6}$ months of age with an average of 84.35, and those below average height or of retarded physiological development complete the elementary school work at 13 years $7\frac{4}{13}$ months of age with an average of 81.72.

The taller, heavier, or physiologically accelerated boys and girls, complete the elementary school at an earlier age and with a higher average mark than the short, light, or physiologically retarded boys and girls. In following the present investigation the reader should be careful not to confuse brightness or precocity with stages of mental maturity. A mind may be more nearly mature than another and still be of inferior quality. The former has certain instincts and mental traits associated with growth which the latter has not experienced. The former is accelerated in growth physiologically.

The second significant explanation of the node or drop in the school standing of the fourth grade lies in the rate of development in physiological maturity of the boys and girls at these ages. The growth charts show there is less physiological growth in height, weight, and lung capacity before the adolescent acceleration than at any other time before the cessation of growth after the adolescent acceleration.

2. SCHOOL STANDING AND GROWTH IN HEIGHT.

Since we have the individual curves for both height, weight, lung capacity, and school standing for all the individuals included in the data for comparison, a very general understanding of the correlations or relationships may be gotten by making individual comparisons for each group.

Comparing the boys' curves in Group I as given in Chart Ia for eight and Chart Ic for school standing, it will be noted that—

The boys who are in advance of their normal grades, Nos. 4, 5, and , are above median height, and No. 10, who has low school marks, is

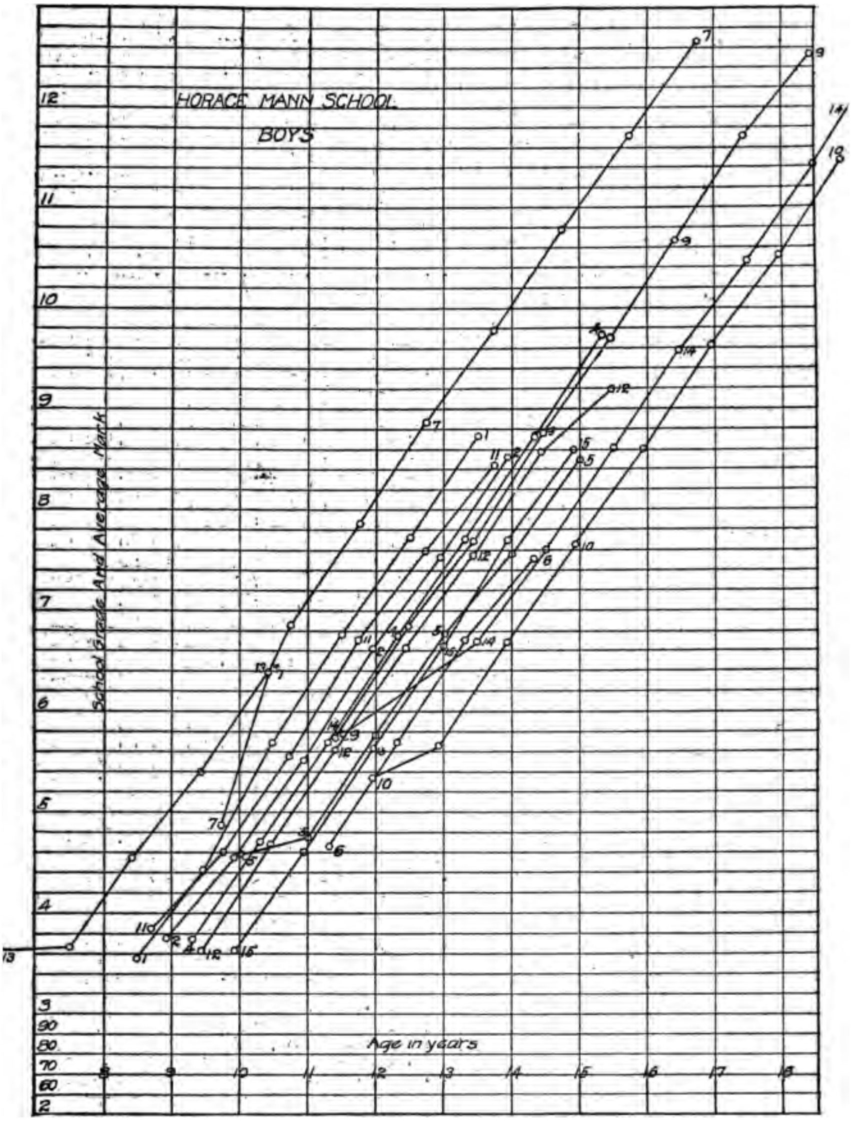

FIG. 32.—(Chart IIIc) School-standing curves for Horace Mann boys.

lightly below median height. Of the boys in this group who are etarded, Nos. 11, 12, 13, and 14 are below median height, and No. 1 ropped below his relative height preadolescent period nd was anæmic. No. 9 became years on accoun absence and again at 18. He has a somewhat irregular growth curve in height during adolescence and is frequently ill.

The school standing of the boys in the second group (Chart IIc) of 15 presents two cases of "skipping a grade," Nos. 13 and 15. No. 13 is retarded one year at 12, and No. 15 one year; after skipping a grade the latter again becomes retarded at 18. In this group Nos. 7 and 12 are in advance of their grades for the short periods attended in the elementary school, the former being above median height, the latter below. The retarded boys are Nos. 10, 11, 13, 14, and 15. All of these are below median height except No. 10, who is anæmic, has appendicitis, and enlarged tonsils.

Chart IIIc shows the same general tendencies for each boy to hold his relative position in regard to school standing and in his ranking with his companions from the elementary to the high school.

In this group 2 boys, Nos. 7 and 13, are in advance of their normal grades. The former is above median height and the latter left school before 12 with an average mark below passing for the last two years. No. 7 has the highest school average of the group.

The retarded boys are Nos. 4, 5, 6, 8, 10, 14, and 15. No. 5 skipped a grade at 13; Nos. 6, 10, and 14 were late entering from another school; Nos. 8, 10, 14, and 15 are below median height.

In the first group of 11 girls (Chart IVc) No. 2 is two grades in advance of her normal grade at 12 years of age, if the same standard for age and grade is used for girls as for boys. Since both enter the schools at about the same chronological age and are promoted on the same basis, this uniform norm seems justifiable, as previously stated. No. 9 is one year in advance of her grade at 16. No. 2 is above median height, and No. 9 below, with good health and excellent school standing extending back to the third grade, which was completed at the early age of 8 years 7 months.

The retarded girls of Chart Vc are Nos. 3, 6, 7, and 8, who are fairly close to median height. No. 3 missed a year and later skipped a grade. No. 7 has low average marks and No. 8 poor health. No. 11 repeated a grade and is short in stature and nervous.

In Chart VIc of 13 there are 4 cases of girls skipping grades and but one case of a girl failing to advance a grade each year, which was not due to low marks. There are 3 cases of retardation before 12 years, and not any at 16, since these girls later omit a grade. Nos. 5, 6, and 7 skipped a grade during the period of most rapid growth.

No. 8 shows a marked arrest in physical growth in height at 14, which lasts until 18 and probably after, and the school marks also tak a decided drop and remain low until 18. No. 9's growth is arrest at 14, and the average marks also fall below previous ones with [illegible] exception, at 16 years, where it is 1 per cent higher than at 12. Th same is true of No. 5, whose growth is arrested between 14 an

The marks of this group (Chart VIIc) are primarily for the period between 12 and 18. There is a wider range of individual differences here than with the previous group. Since the group gives 4 cases of marked arrest during the adolescent period, it is worth while to note

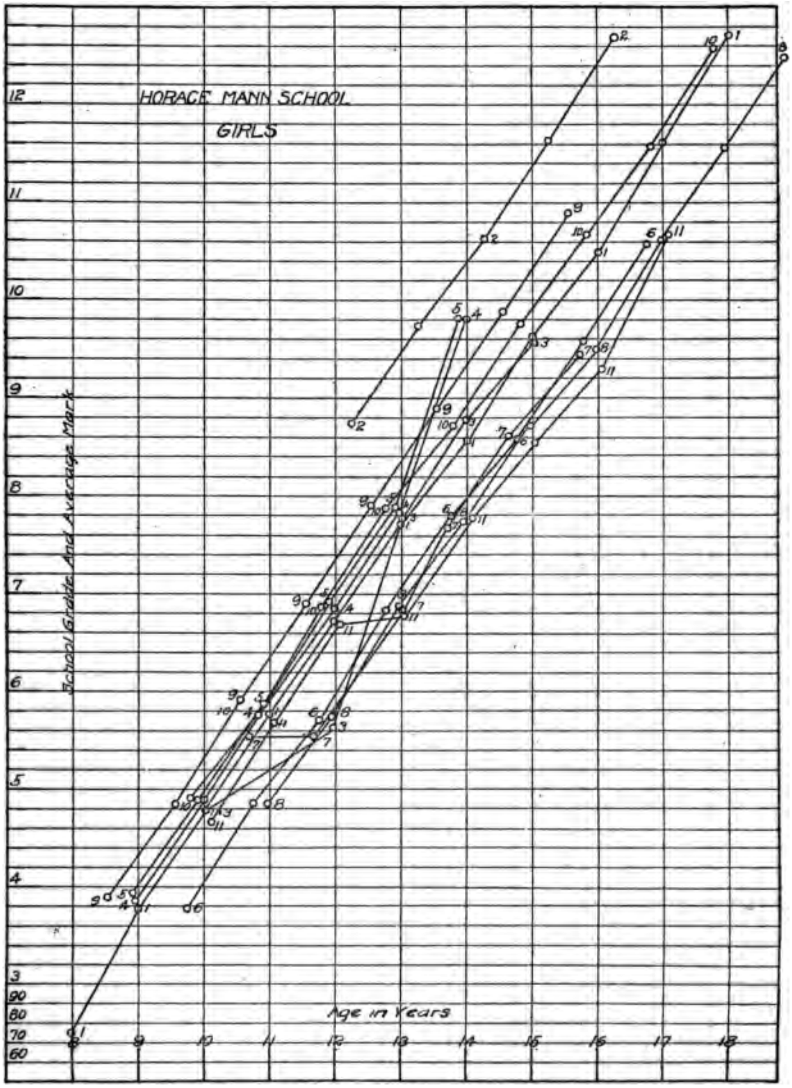

FIG. 33.—(Chart IVc) School-standing curves for Horace Mann School girls.

the corresponding changes in school standing. It may be noted all of these girls are retarded by grade except Nos. bove median height.

No. 2, who is a
retarded one g

growth in height began to be most noticeable between 12 and 13 and continued until 17, and the final average mark began to fall between 14 and 15, and continued until 18. No. 6's physical growth was

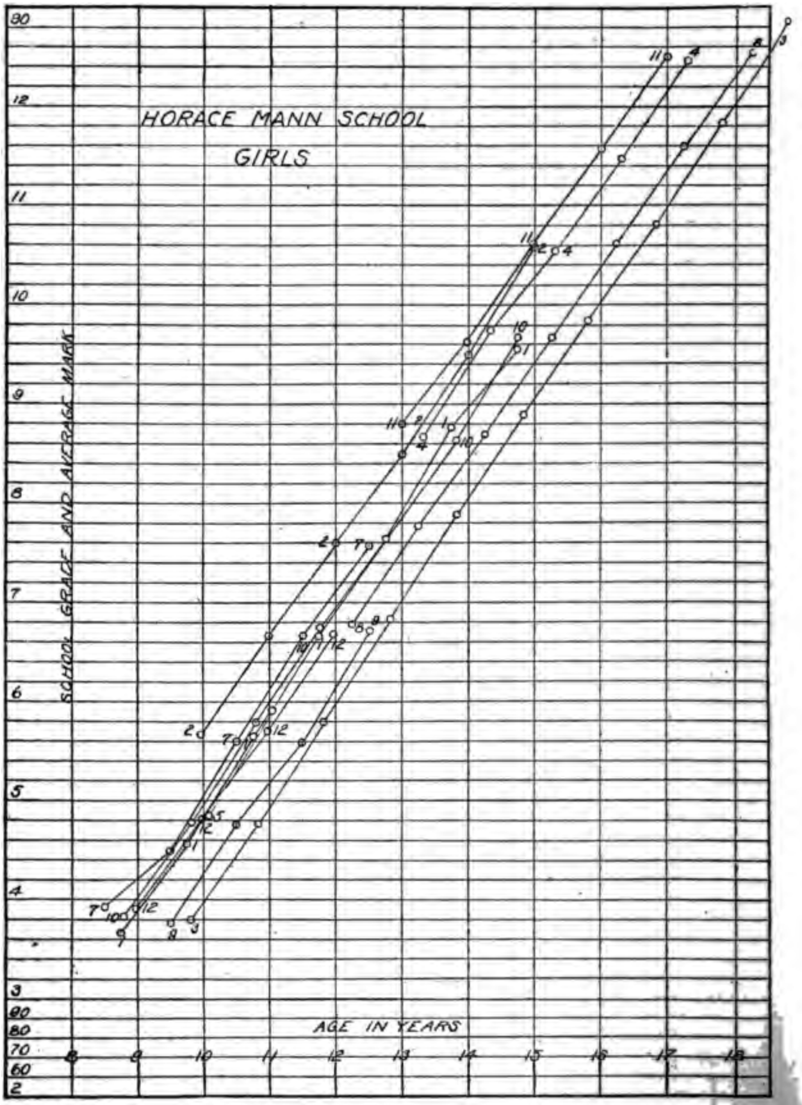

FIG. 34.—(Chart Vc) School-standing curves for Horace Mann School girls.

arrested between 12½ and 13½, and continued while the marks decreased between 15 and 16, and continued. No. 9's growth was arrested between 13 and 14, there was an ac drop in average mark, and both marks and growth in tinued low. No. 10 was arrested in height at 14 a school marks between 14 and 15 continued. No. 11's arrest in physical growth in height occurred at 16 and the lowering of marks

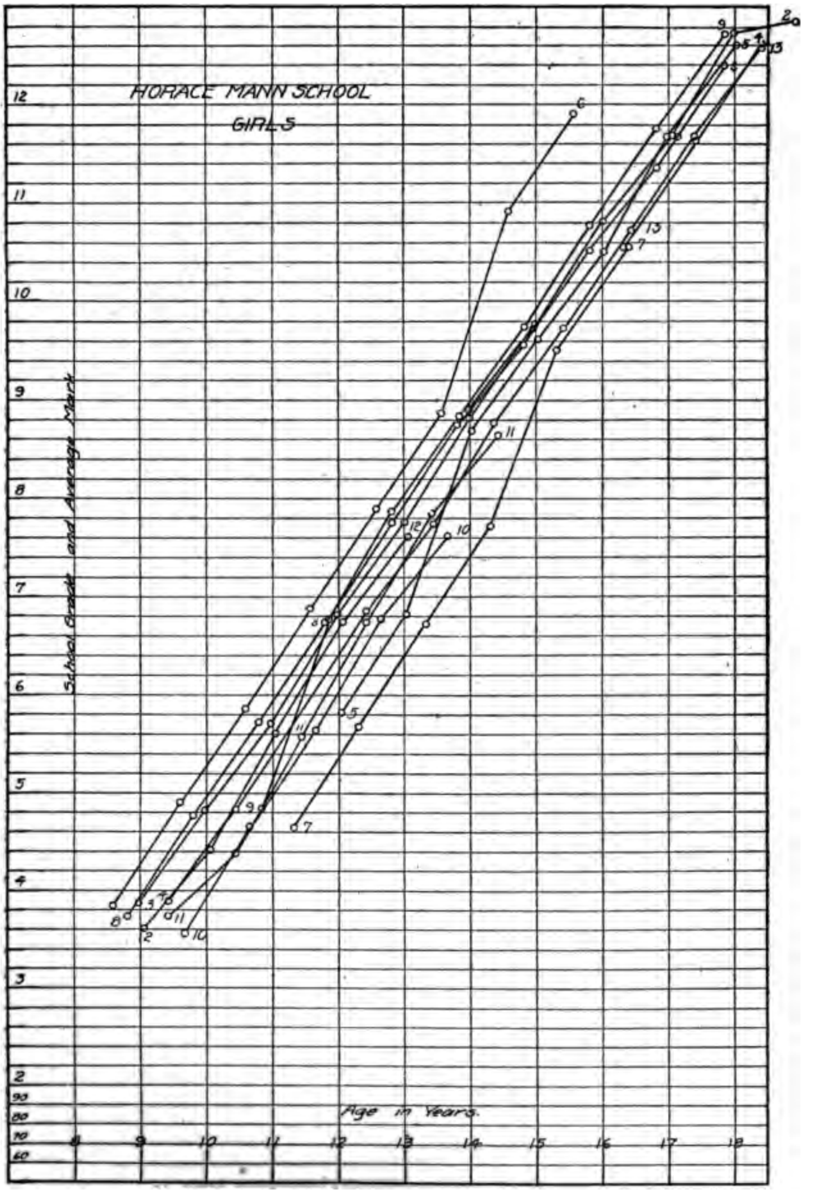

FIG. 35.—(Chart VIe) School-standing curves for Horace Mann School girls.

occurred between ntinued. These 5 girls were also

gra

vs is found remarkable

average mark to the

next. No skipping, no dropping, and few individual fluctuations. There is, however, a wide range of individual differences, and the final average marks are in practically all cases low. In Chart VIIIc 1 boy (No. 2) is above average grade for his age, and 3 (Nos. 6, 7, and

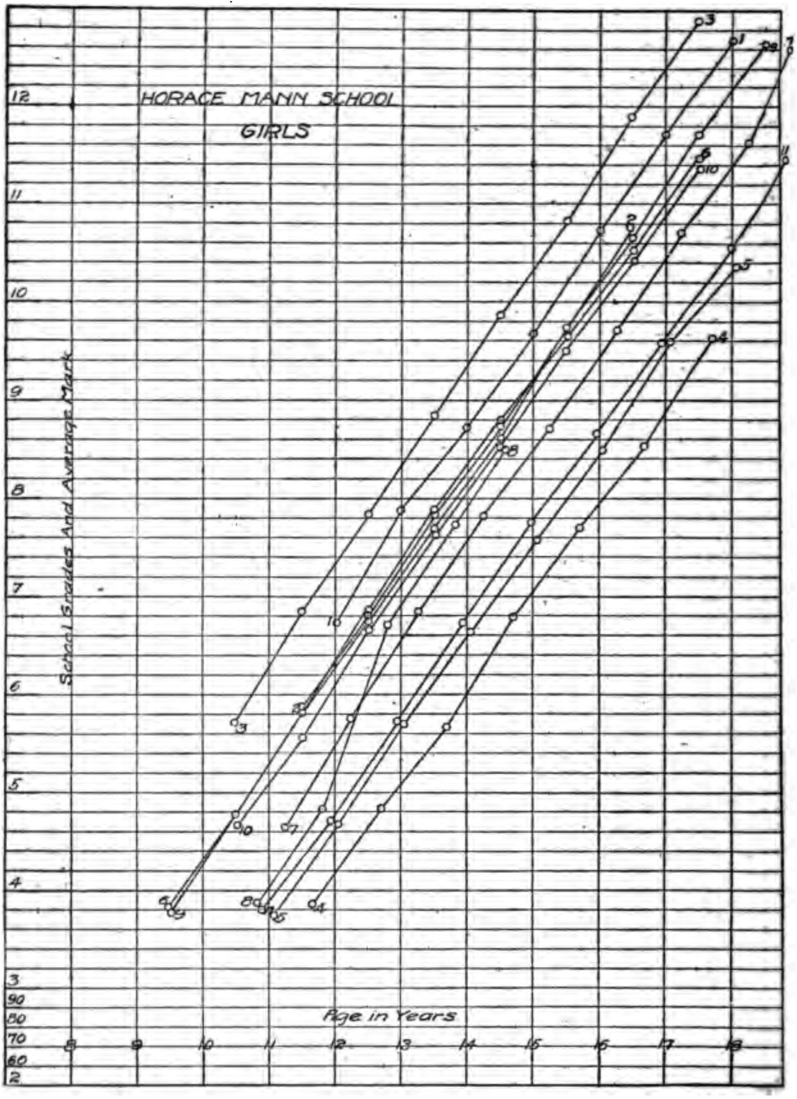

FIG. 36.—(Chart VIIc) School-standing curves for Horace Mann School girls.

8) are below. No. 2 is above median height; No. 6 is below Nos. 7, 8, and 10 about median height; No. 12 has the l of the group.

It should be stated here that the Parker School is a small school, which keeps records and marks closely. emphasis is placed on marks.

Chart Xc shows remarkable uniformity of grades and marks and a narrow range of differences. This close uniformity makes it difficult to find correlations between the large number of individual differences and fluctuations in physical growth and school standing. Four of these girls are retarded by grades, Nos. 1, 4, 9, and 12. Two are above median height and 2 below. All show marked individual fluctuations. No. 12 has the lowest average, is of shortest stature, and shows more fluctuations than the others.

The girls, like the boys of this school, have lower average marks than the Horace Mann School pupils. In this group (Chart XIc) the final of all is 81 per cent, but 5 of these girls are one year in advance of their normal grade for their age, if we use our previous hypothesis that a year of school is equivalent to a grade. In general, the average marks of these 5 girls are higher than the others.

There are 3 girls (Nos. 2, 5, and 7) who are retarded by grade, and No. 2 is below median stature, No. 5 shows marked arrest from 12 to 18, and has low average marks. No. 7 shows arrest from 14 and has low marks. As a rule the children above median height are in normal grade or accelerated.

3. SCHOOL STANDING AND GROWTH IN WEIGHT.

In his investigations on the physical basis of precocity and dullness, Dr. Porter[1] found on the basis of age and grade distribution that "precocious are heavier, and dull children lighter, than the mean child of the same age. This establishes a basis of precocity and dullness." The basis of precocity, for Porter, was found in the unusually favorable physical development. Boas[2] found several serious objections to this conclusion, and maintained that "children who remain out of school for a long time will lag behind; vigorous ones will advance more rapidly." This is no doubt true, but the number of such children among the many thousands studied by Porter would have little effect in vitiating general conclusions. Another objection raised by Boas, which is very significant, was that these children were not "dull," but "retarded," and a retarded child may develop and become quite "bright."

In an attempt to ascertain the relation of precocity to physical development, Boas used data collected by Dr. G. M. West at Toronto, who, in turn, used the teacher's judgment in regard to the child's brightness. The results were diametrically opposed to Porter. Here, again, there is an apparent contradiction, due to an attempt to correlate "brightness," when based on the teacher's judgment, with phys-
instead of correlating a more definite criterion of a
idenced by school standing, mental tests, or
ale, with physical development. Porter's
mental development depended upon

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erence.

[2] See Boas, 12th reference.

physical growth, instead of seeing that physical growth and mental growth are correlated; Boas's mistake was to assume that a teacher's estimate of a child's "brightness" at one age could be used as a standard for measuring mental development or mental maturity through several years.

MacDonald, in his Washington studies, used the teachers' estimate of brightness as a basis, and Smedley in his study of Chicago children used the age and grade and both found that "bright" children are taller than "dull" ones. This conclusion is also claimed by Gratsianoff and Sack in Russia, but Gilbert[1] discovered no constant correlation between height and mental ability.

The same conclusions hold for weight as for height; Porter and Smedley found a positive correlation, West a negative correlation, and Gilbert no constant relationship.

The important conclusion here was long ago anticipated by Porter, but on account of the doubtful attitude of these other investigators toward his result, it has received little or no attention. He very wisely says, "No child whose weight *or height*[2] is below the average (*median or norm*) for its age should be permitted to enter a school grade beyond the average of its age except after such a physical examination as shall make it probable that the child's strength is equal to the strain."

4. SCHOOL STANDING AND GROWTH IN LUNG CAPACITY.

That there is a possible correlation between school standing and lung capacity is indicated by the fact that, if the 5 boys or 5 girls with the greatest lung capacity are selected, the average school marks for these are invariably above the average school marks of any 5 with the lowest average lung capacity. This holds true for each group, but it is, however, not a complete or accurate test, since all cases are not included and the grades and lung capacity are both materially influenced by the age of the boy or girl.

If the average lung capacity for the same period included within the school standing is taken, it throws some light on the correlations of the two variables, but only when the chronological and physiological ages are taken into consideration, since the lung capacity increases with age and the marks tend, on the average, to decrease in the upper grades. It is apparent, then, that any attempt at correlation will have to take into consideration the median lung capacity for different ages and the median mark for the different ages within the same group. But since there are so few individuals included within a grade and since the marks vary
same individuals from grade to grade, it is suffi
average mark for each individual and compare

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[1] See Gilbert, 2d reference.

[2] The words in italics

average mark of all the individuals from each school and determine whether the individual is above or below average school mark, making proper allowance for retardation and acceleration.

The median lung capacity for boys and girls for different ages are those previously found for the Francis W. Parker School and the University of Chicago elementary and high school and are approximately the same as those used at the Horace Mann School by Dr. Wood.

Selecting the 5 in Chart Ic whose standing is above average mark for the group, Nos. 1, 3, 11, 12, 14, the first 4 are above the median in lung capacity; No. 4 is retarded by grade, which will help to explain his high average mark. No. 7 also has high lung capacity, but he is in advance of his normal grade.

Of those below the average grade, No. 4 has good lung capacity but entered this school late and apparently poorly prepared. No. 10 has comparatively low lung capacity and is below average mark and retarded in grade.

Those whose marks are above the average in Chart IIc are Nos. 1, 4, 5, 6, 7, 9, and 15. Nos. 1, 4, 5, 7, and 9 are above the median in lung capacity; Nos. 6 and 15 are retarded one year in grade, which would help to explain their higher average mark.

Of those below average mark Nos. 2 and 3 are above median lung capacity, Nos. 8, 11, and 12 are below median lung capacity, No. 10 is below median lung capacity part of the time and below grade, No. 13 below median lung capacity but above grade, and No. 14 below median lung capacity and grade.

In Chart IIIc those below the average mark, 81 per cent, are Nos. 2, 3, 8, 10, 11, 12, 13, and 14, and all are below median lung capacity except No. 10, who is slightly above median and two years retarded by grade; Nos. 2 and 3 are above median lung capacity but are in normal grade and only 1 per cent below the average mark.

Those above the average school mark in Chart IVc are Nos. 4, 5, and 9. The first two girls are above median lung capacity, and No. 9 is below with no apparent cause.

Those below average school mark are Nos. 1, 2, and 7. No. 1 is above the median lung capacity, and Nos. 2 and 7 are above during most of the school course. No. 2 is two grades above normal, and No. 7 is one grade below and frequently absent.

Those above average mark in this group (Chart Vc) are Nos. 3, 5, and 12. No. 3 is above median lung capacity, but below grade; No. 5 is above and No. 12 about median lung capacity. Those below average mark are Nos. 2, 4, 6, 7, 9, and 11a. Nos. 2, 4, 6, and 7 are above and Nos. 9 and 11 below median lung capacity. Nos. 2 and 4 are bove average grade, which would help explain their low mark. No. 6 had a record for but one year; [illegible] is retarded, and No. 11 in advance f his grade one year.

Those above average mark in this group (Chart VIc) are Nos. 2, 3, 6, and 9. Nos. 2, 3, and 6 are above median lung capacity, and No. 9

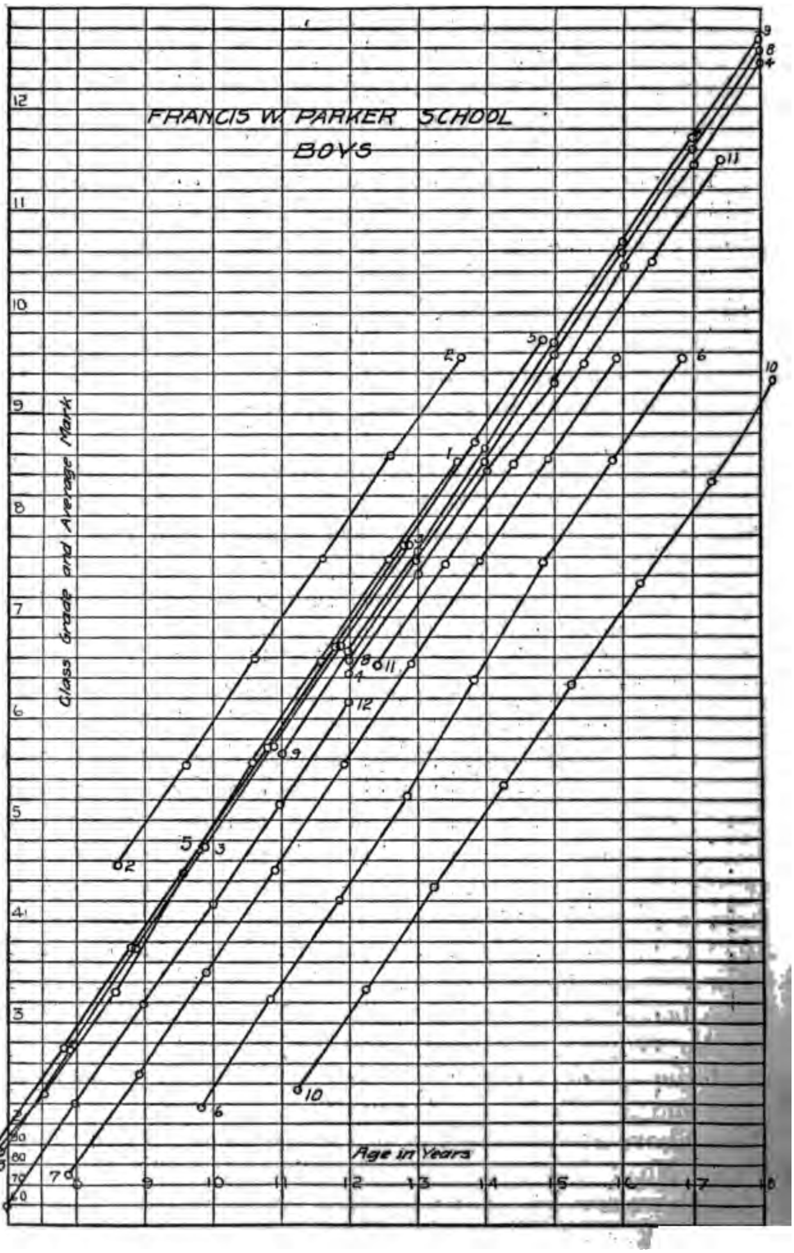

FIG. 37.—(Chart VIIIc) School standing curves for Francis W. Parker Sch

is above median lung capacity until age.
average mark are Nos. 4, 5, 7, 8, 1
median lung capacity, but is one ye is

No. 5 is above median lung capacity, but gradually drops in school standing; No. 7 is below median lung capacity and below grade;

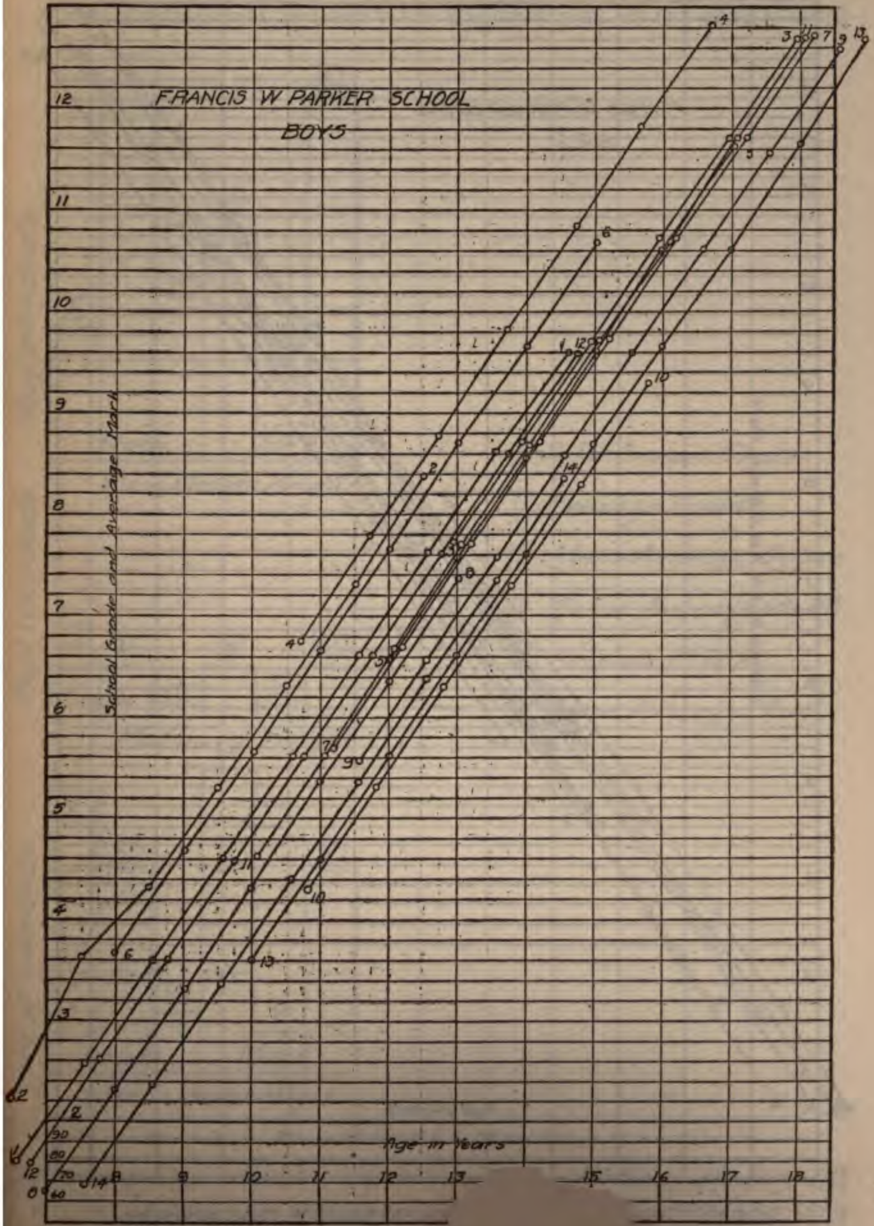

FIG. 38.—(Chart IXc) School standing er School boys.

ve median lung cap w average mark;
w median lung c low average
11, 12, and 13

In Chart VIIc those above average mark are Nos. 2, 3, and 8. Nos. 2 and 3 are above and No. 8 below median lung capacity, but No. 8

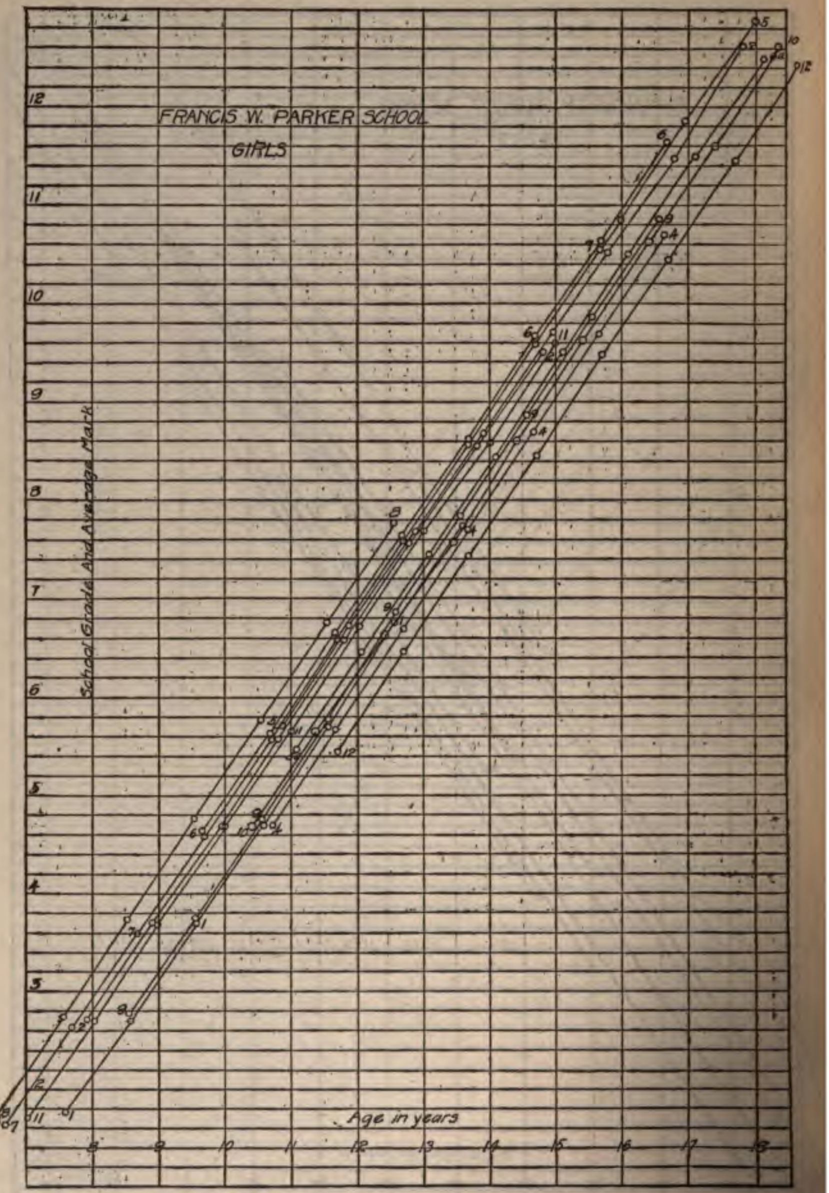

FIG. 39.—(Chart Xc) School standing curves for Francis W. Parker School girl

is two years below normal grade at 12 years, which helps
the high mark. Those below average mark are Nos. 5, 9,
In Chart VIIIc those above averag [illegible] are Nos. 3, 2,

Nos. 2, 3, 5, and 8 are above median lung capacity and No. 9 above during later school life. No. 2 is also above school grade.

Those below average school mark are Nos. 4, 6, 10, and 12. No. 4 s above median lung capacity for the first part of the school work

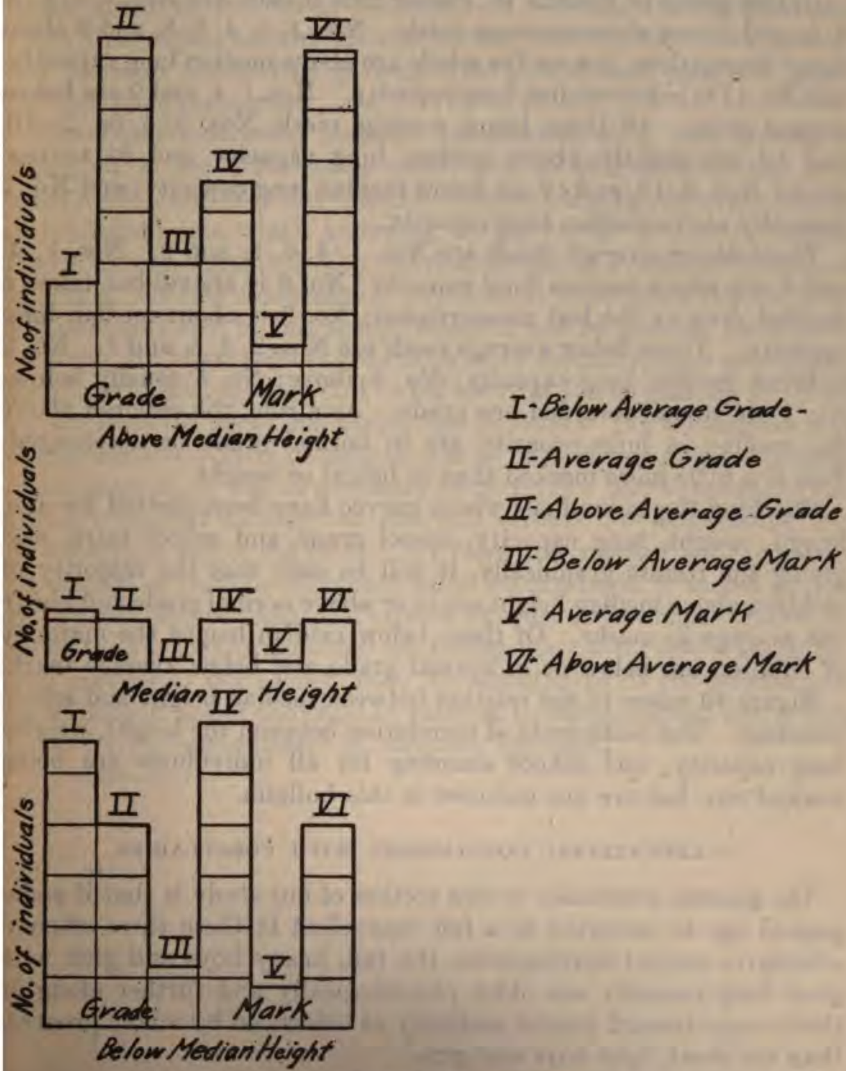

FIG. 40.—Height and school standing.

and two grades retarded, but is later above in lung capacity and gradually increases in average [illegible]. No. 10 is below median lung and is three [illegible] d; No. 12 is below median lung

up (Ch [illegible] 4 boys below the average school Fra [illegible] No. 2 is one grade above normal, but has uniformly low standing. Nos. 10 and 14 are retarded one grade, No. 14 is slightly above median lung capacity, and No. 10 starts high, but drops below median lung capacity, and No. 13 is below.

In this group of Francis W. Parker girls (Chart Xc) Nos. 1, 3, 4, 5, 8, 9, and 11 are above average mark. Nos. 1, 3, 4, 5, 8, and 9 show many fluctuations, but on the whole are above median lung capacity, and No. 11 is below median lung capacity. Nos. 1, 4, and 9 are below normal grade. Of those below average mark, Nos. 2, 6, 6a, 7, 10, and 12 are slightly above median lung capacity and in normal grade; Nos. 6, 10, and 12 are below median lung capacity; and No. 7 generally above median lung capacity.

Those above average mark are Nos. 1, 4, 6, 8, and 9. Nos. 1, 4, and 8 are above median lung capacity; No. 6 is above, but takes a decided drop at the last measurement; No. 9 is about median lung capacity. Those below average mark are Nos. 2, 3, 5, and 7. No. 2 is below median lung capacity; No. 3 above; No. 5 usually below; No. 7 above and retarded one grade. As a rule, the children above the median in lung capacity are in normal grade or accelerated. This is a little more marked than in height or weight.

Checking the individuals whose curves have been plotted for age, height, weight, lung capacity, school grade, and school mark, and giving the results graphically, it will be seen that the majority of children above median height are in or above normal grade and above the average in marks. Of those below median height the majority of children are below or in normal grade and below average mark.

Figure 40 refers to the relation between median height and school standing. The coefficients of correlation between the height, weight, lung capacity, and school standing for all individuals are being worked out, but are not included in this bulletin.

5. EDUCATIONAL CONCLUSIONS WITH COROLLARIES.

The general conclusion to this section of our study is that if pedagogical age be accepted as a fair equivalent in these three efficient schools to mental development, the tall, heavy boys and girls with good lung capacity are older physiologically and further along in their stages toward mental maturity as evidenced by school progress than the short, light boys and girls.

The main educational corollaries which logically follow from this study would require that our school systems, public and private, be graded on the physiological age and the accompanying stage of mental maturity of boys and girls in place of the c
as is now done. This would require that tall, he
accelerated physiological age be

school as rapidly as possible within the limits of thoroughness, and that the small, light children of retarded physiological development be kept below or in the normal grade doing supplementary work, since these short, light pupils are immature mentally, although in many instances precocious in brightness. It also follows from the study that rapid, healthy growth favors good mental development, and therefore the healthy growing child should have plenty of physical and mental exercise.

The Binet measuring scale for intelligence, as is well known, is based on a two dimensional scale—that of chronological age and mental age—but does not take into account the third dimension, or physiological age, which according to the results of this investigation is closely correlated with the mental age, as evidenced by school standing. If this conclusion is correct, and it certainly follows from the data included in this study, would it not be possible for a child of immature physiological growth to be of normal mental growth for his physiological age and still to fall short of the mental age required by the tests for his chronological age in years? For a complete and comprehensive system of mental tests to be used as a measuring scale of intelligence, it will be necessary to go further and supplement the Binet tests and include the essential criteria for determining the physiological age of the child. We have now reached a stage in our knowledge of child development when we can begin to search intelligently for these physiological criteria in order to formulate more adequate tests as measuring scales for intelligence and for school standing. The grading of our schools must be adjusted to fit the mental and physiological age of the child in place of its chronological age, which is not fairly representative of the other two ages.

III. STATISTICAL

(A) INDIVIDUAL INCREMENTS OF GROWTH

TABLE 13.—*Increments of growth in height for a group of*

No.	7 years.			7½ years.			8 years.			8½ years.			9 years.			9½ years.			10 years.		
	Height.	Increment, 6–7 years.	Per cent gain.	Height.	Increment, 6½–7½ years.	Per cent gain.	Height.	Increment, 7–8 years.	Per cent gain.	Height.	Increment, 7½–8½ years.	Per cent gain.	Height.	Increment, 8–9 years.	Per cent gain.	Height.	Increment, 8½–9½ years.	Per cent gain.	Height.	Increment, 9–10 years.	Per cent gain.
	Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm*	*Cm.*		*Cm.*	*Cm.*	
101	109.2	...	...	...	...	...	112.9	3.7	3.3	115.0	...	...	116.0	3.1	2.7	119.7	4.7	4.1	121.0	5.0	4.3
102	...	...	...	109.5	...	...	...	...	...	114.1	4.6	4.2	...	...	...	116.9	2.8	2.5	...	...	...
103	111.6	4.6	4.3	...	...	...	116.0	4.4	3.9	...	...	...	121.0	5.0	4.3	...	...	...	125.0	4.0	3.3
104	...	...	...	112.0	3.3	3.0	...	...	...	116.7	4.7	4.2	...	...	...	121.2	4.5	3.9	...	...	...
105	...	...	...	112.7	...	...	...	...	...	116.8	4.1	3.6	...	...	...	121.2	4.4	3.8	...	...	...
106	112.0	...	...	...	...	...	115.8	3.8	3.4	...	...	...	117.0	1.2	1.0	...	...	...	124.8	7.8	6.7
107	...	...	...	113.4	...	...	...	...	...	118.2	4.8	4.2	...	...	...	123.0	4.8	4.1	...	...	...
108	...	...	...	...	...	...	114.1	...	...	...	...	...	123.4	9.3	8.2	...	...	...	127.0	3.6	2.9
109	114.8	...	...	119.4	6.7	5.9	120.2	5.4	4.7	120.2	.8	.6	...	...	...	126.1	5.9	4.9	128.7	...	...
110	...	...	...	...	...	...	120.0	...	...	...	...	...	122.1	2.1	1.8	...	...	...	127.1	5.0	4.1
111	...	...	...	115.4	...	...	120.7	...	...	...	...	...	125.0	4.3	3.6	...	...	...	130.2	5.2	4.2
112	116.2	5.0	4.5	...	...	...	121.6	5.4	4.6	...	...	...	125.6	4.0	3.3	...	...	...	130.0	4.4	3.5
113	116.3	...	...	...	...	...	121.8	5.5	4.7	...	...	...	126.1	4.3	3.5	132.0	...	...	...	...	...
114	116.6	6.0	5.4	...	...	...	122.0	5.4	4.6	...	...	...	128.6	6.6	5.4	...	...	...	133.6	5.0	3.9
115	...	...	...	117.2	5.2	4.6	...	...	...	122.7	5.5	4.7	...	...	...	129.6	6.9	5.6	...	...	...
116	118.0	...	...	...	...	...	121.4	3.4	2.9	...	...	...	125.5	4.1	3.4	...	...	...	130.4	4.9	3.9
117	118.0	...	...	...	...	...	121.0	3.0	2.5	...	...	...	...	...	...	...	...	...	130.1	...	...
118	...	...	...	118.5	4.3	3.8	...	...	...	123.0	4.5	3.8	...	...	...	127.8	4.8	3.9	132.0	...	...
119	...	...	...	118.4	...	...	...	...	...	124.6	6.2	5.2	...	...	...	129.4	4.8	3.9	...	...	...
120	...	...	...	119.0	4.0	3.5	...	...	...	123.0	4.0	3.4	...	...	...	128.2	5.2	4.2	...	...	...
121	...	...	...	119.8	...	...	...	...	...	123.0	3.2	2.7	...	...	...	128.2	5.2	4.2	...	...	...
122	120.2	...	...	...	...	...	...	...	...	124.5	...	...	...	...	...	130.4	5.9	4.8	...	...	...
123	...	...	...	120.0	...	...	...	...	...	123.5	3.5	2.9	...	...	...	129.0	5.5	4.5	...	...	...
124	...	...	...	121.3	5.8	5.0	...	...	...	126.3	5.0	4.1	129.7	...	...	131.6	5.3	4.2	...	...	...
125	...	...	...	...	...	...	126.0	...	...	...	...	...	129.6	3.6	2.9	...	...	...	135.3	5.7	4.4
Av.	...	5.2	4.7	...	4.9	4.3	...	4.4	3.9	...	4.2	3.6	...	4.3	3.6	...	5.5	4.2	...	5.1	4.1
Av. var.	...	.5	...	...	1.0	...	...	.9	...	...	.9	...	...	1.4	...	...	.8	...	...	.7	...
126	121.4	...	...	...	...	...	129.2	7.8	6.4	...	...	...	133.3	4.1	3.2	...	...	...	138.6	5.3	4.0
127	122.9	...	...	...	...	...	127.7	4.8	3.9	...	...	...	132.8	4.1	8.7	...	...	...	137.4	4.6	3.5
128	123.0	...	...	...	...	...	128.7	5.7	4.6	...	...	...	135.3	6.6	5.1	...	...	...	141.1	5.8	4.3
129	...	...	...	124.0	...	...	...	...	...	130.0	6.0	4.8	...	...	...	134.6	4.6	3.5	...	...	...
130	124.5	...	...	129.3	...	...	...	...	...	...	...	...	133.8	...	...	137.1	...	...	140.0	6.2	4.6
131	125.0	...	...	...	...	...	...	...	...	130.1	...	...	...	...	...	134.5	4.4	3.4	...	...	...
132	...	...	...	125.0	...	...	...	...	...	...	...	...	132.6	...	...	137.2	...	...	...	...	...
133	125.5	...	...	...	...	...	133.6	8.1	6.5	...	...	...	138.0	4.4	3.3	143.5	...	...	...	...	...
134	...	...	...	125.5	...	...	127.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
135	...	...	...	125.6	...	...	...	...	...	134.4	8.8	7.0	...	...	...	139.2	4.8	3.6	...	...	...
136	...	...	...	125.6	...	...	131.6	...	...	...	...	...	136.6	5.0	3.8	...	...	...	141.4	4.8	3.5
137	...	...	...	125.7	...	...	...	...	...	...	...	...	131.8	...	...	134.7	...	...	...	...	...
138	125.8	...	...	...	...	...	131.2	...	...	...	...	...	138.6	7.4	5.6	...	...	...	144.0	5.4	3.9
139	...	...	...	125.9	...	...	129.7	...	...	...	...	...	138.4	8.7	6.7	138.4	...	...	...	...	...
140	...	...	...	125.9	...	...	...	...	...	132.1	6.2	4.9	...	...	...	137.4	5.3	4.0	...	...	...
141	...	...	...	126.0	...	...	...	...	...	131.5	5.5	4.4	...	...	...	135.0	3.5	2.7	...	...	...
142	...	...	...	126.0	7.2	6.1	129.4	...	...	130.2	4.2	3.3	...	...	...	...	...	...	139.0	...	...
143	126.4	...	...	132.1	...	...	...	...	...	130.1	7.0	5.3	...	...	...	...	...	...	147.0	...	...
144	...	...	...	127.5	...	...	...	...	...	...	...	...	...	...	...	138.3	...	...	...	...	...
145	...	...	...	131.3	5.9	4.7	...	...	...	136.8	5.5	4.2	...	...	...	143.2	6.4	4.7	...	...	...
146	132.0	...	...	...	...	...	138.4	6.4	4.9	...	...	...	144.2	5.8	4.2	147.4	...	...	150.3	6.1	4.2
147	132.4	8.0	6.4	...	...	...	136.4	4.0	3.0	...	...	...	141.6	5.2	3.8	...	...	...	147.5	5.9	4.2
148	128.3	...	...	133.0	...	...	...	...	...	...	...	...	135.6	...	...	140.9	...	...	141.3	5.7	4.2
149	...	...	...	133.3	...	...	...	...	...	139.4	6.1	4.6	...	...	...	142.1	2.7	1.9	...	...	...
150	139.6	9.6	7.4	...	...	...	145.1	5.5	3.9	...	...	...	...	...	...	...	...	...	153.6	...	...
Av.	121.8	8.8	6.9	122.7	6.5	5.9	125.7	6.0	4.7	125.9	6.2	4.8	130.5	6.5	4.9	132.6	4.5	3.4	135.9	5.5	4.0
Av. var.	...	.8	...	...	.7	...	...	1.2	...	...	.9	...	...	1.8	...	...	.9	...	...	.5	...

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[1] The tables for the boys' heights (4 and 5) may be found on **pages 26-29.**

MATERIAL.

IN HEIGHT, WEIGHT, AND LUNG CAPACITY.

50 boys with consecutive measurements from 7 to 13 years of age.[1]

10½ years.			11 years.			11½ years.			12 years.			12½ years.			13 years.			
Height.	Increment, 9½–10½ years.	Per cent gain.	Height.	Increment, 10–11 years.	Per cent gain.	Height.	Increment, 10½–11½ years.	Per cent gain.	Height.	Increment, 11–12 years.	Per cent gain.	Height.	Increment, 11½–12½ years.	Per cent gain.	Height.	Increment, 12–13 years.	Per cent gain.	No.
Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		
			123.6	2.6	2.1	125.6			127.5	3.9	3.2	129.7	4.1	3.3	131.2	3.7	2.9	101.
121.4	4.5	3.8				125.6	4.2	3.4				128.4	2.8	2.3				102.
			129.5	4.5	3.6				132.3	2.8	2.2							103.
125.0	3.8	3.1				128.7	3.7	3.0				133.2	4.5	3.5				104.
126.0	4.8	4.0				131.6	5.6	4.4				135.3	3.7	2.8				105.
			128.7	3.9	3.1				132.9	4.2	3.3				137.0	4.1	3.1	106.
128.4	5.4	4.4				132.6	4.2	3.3										107.
			130.1	3.1	2.4				134.2	4.1	3.2				139.4	5.2	3.9	108.
						130.5			138.4			138.9	8.4	6.4	143.5	5.1	3.7	109.
			132.3	5.2	4.1				135.4	3.1	2.3				139.9	4.5	3.3	110.
			133.6	3.4	2.6				137.6	4.0	3.0				142.1	4.5	3.3	111.
			134.2	4.2	3.2				138.0	3.8	2.8				141.6	3.6	2.6	112.
135.7	3.7	2.8				140.9	5.2	3.8				145.7	4.8	3.4				113.
			138.9	5.3	4.0										148.5			114.
133.2	3.6	2.8				137.5	4.3	3.2				142.3	4.8	3.5				115.
			135.5	5.1	3.9				139.3	3.8	2.8				146.0	6.7	4.8	116.
			131.0	.9	.7	133.0						138.1	5.1	3.8	139.7			117.
			134.2	2.2	1.7				137.4	3.2	2.4				140.2	2.8	2.0	118.
134.1	4.7	3.6				138.0	3.9	2.9										119.
133.9	5.7	4.4				139.2	5.3	4.0										120.
133.0	4.8	3.7				135.9	2.9	2.2				141.8	5.9	4.3				121.
133.9	3.5	2.7				138.1	4.2	3.1				146.0	7.9	5.7				122.
133.2	4.2	3.3				137.1	3.9	2.9				140.9	3.8	2.8				123.
134.7	3.1	2.4	139.3						143.4	4.1	2.9				150.1	6.7	4.7	124.
			139.1	3.8	2.8				144.2	5.1	3.7				149.6	5.4	3.7	125.
	4.3	3.4		3.7	2.9		4.3	3.3		3.8	2.9		5.0	3.8		4.8	3.5	Av.
	.7			1.0			.6			.4			1.2			1.0		Av. var.
			144.1	5.5	4.0	148.1						155.0	6.9	4.7				126.
			141.4	4.0	2.9				146.0	4.6	3.3				150.5	4.5	3.1	127.
			147.1	6.0	4.3				156.5	9.4	6.4				166.7	10.2	6.5	128.
141.4	6.8	5.0				144.0	2.6	1.8				148.9	4.9	3.4				129.
143.5	6.4	4.7	145.1	5.1	3.6				150.0	4.9	3.4	155.5						130.
141.2	6.7	5.0	147.0						150.9	3.9	2.6				158.1	7.2	4.8	131.
141.4	4.2	3.1				145.2	3.8	2.7				146.6	1.4	1.0				132.
148.1	4.6	3.2				152.2	4.1	2.8				159.9	7.7	5.1				133.
138.6			142.0			144.6	6.0	4.3	146.8	4.8	3.4	149.0	4.4	3.0				134.
143.6	4.4	3.2				148.6	5.0	3.5										135.
			146.8	5.4	3.8				151.9	5.1	3.5							136.
139.6	4.9	3.6				144.4	4.8	3.4				149.1	4.7	3.3				137.
			151.0	6.0	4.2				156.6	5.6	3.7							138.
			147.3						150.8	3.5	2.4	151.6			155.7	4.9	3.2	139.
142.2	4.8	3.5				147.3	5.1	3.6										140.
140.2	5.2	3.9				144.5	4.3	3.1				148.9	4.4	3.0				141.
141.5			145.0	6.0	4.3	147.5	6.0	4.2	149.8	4.8	3.3	150.8	3.3	2.2	153.1	3.3	2.2	142.
150.5						156.2	5.7	3.8				161.0	4.8	3.1				143.
143.2	4.9	3.5				147.1	3.9	2.7				152.5	5.4	3.7				144.
148.2	5.0	3.5				152.5	4.3	2.9				159.7	7.2	4.7				145.
153.1	5.7	3.9	156.3	6.0	4.0				161.2	4.9	3.1				168.9	7.7	4.8	146.
			152.1	4.6	3.1				158.1	6.0	3.9				163.9	5.8	3.7	147.
144.2	3.3	2.3	145.6	4.3	3.0				150.3	4.7	3.2	153.6						148.
145.7	3.6	2.5				149.0	3.3	2.3				152.1	3.1	2.1				149.
155.2			157.8	4.2	2.7				161.8	4.0	2.5				167.6	5.8	3.6	150.
139.1	5.0	3.6	140.6	5.2	3.6	140.9	4.5	3.2	145.2	5.1	3.5	146.7	4.9	3.3	149.2	6.2	3.9	Av.
	.8			.8			.8			.9			1.3			1.9		Av. var.

TABLE 14.—*Increments of growth in height for a group of 50*

No.	12 years.			12½ years.			13 years.			13½ years.			14 years.		
	Height.	Increment, 11–12 years.	Per cent gain.	Height.	Increment, 11½–12½ years.	Per cent gain.	Height.	Increment, 12–13 years.	Per cent gain.	Height.	Increment, 12½–13½ years.	Per cent gain.	Height.	Increment, 13–14 years.	Per cent gain.
	Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*	
151	134.9			137.2						149.0	11.8	8.6			
152	134.0	5.6	4.4				137.9	3.9	2.9	140.6					
153	134.6			136.6	3.8	2.9	139.4	4.8	3.6	142.0	5.4	4.0			
154	135.4						145.3	9.9	7.3				149.6	4.3	3.0
155	136.3	5.1	3.9				146.1	9.8	7.2				153.4	7.3	5.0
156				137.2			140.8						144.1	3.3	2.3
157	137.9	2.5	1.8				144.0	6.1	4.4						
158							137.9						141.6	3.7	2.7
159	137.2						142.0	4.8	3.5	144.0					
160	138.6						143.6	5.0	3.6				149.1	5.5	3.8
161				138.3						143.5	5.2	3.8			
162				139.4	2.3	1.7				147.0	7.6	5.5			
163	139.6	3.6	2.6				143.7	4.1	2.9				152.9	9.2	6.4
164	140.0						146.6	6.6	4.2				155.2	8.6	5.9
165				140.1	5.7	4.2				147.2	7.1	5.1			
166	141.6						152.0	10.4	7.3	156.2					
167				141.6	2.3	1.7				148.7	7.1	5.0	153.9		
168	142.5	4.0	2.9	144.5						149.0	4.5	3.1			
169	142.2						147.2	5.0	3.5				155.4	8.2	5.6
170				142.0	2.9	2.1	144.2						148.4	4.2	2.9
171	142.0	9.0	6.7				145.2	3.2	2.2				155.0	9.8	6.7
172				143.4	4.8	3.5				147.7	4.3	3.0			
173				144.6	5.7	4.1	156.0						159.5	3.5	2.2
174				145.4	4.4	3.1				149.7	4.3	3.0			
175				145.4	6.1	4.4				151.7	6.3	4.3			
Average		5.0	3.7		4.2	3.1		6.1	4.4		6.4	4.5		6.1	4.2
Average var		1.6			1.2			2.1			1.6			2.2	
176	140.5						142.4	1.9	1.3				148.5	6.1	4.3
177	141.7			145.5			146.8	5.1	3.6	148.9	3.4	2.3	150.0	3.2	2.2
178	143.8						149.0	5.2	3.6				153.5	4.5	3.0
179	144.9	4.3	3.1				148.2	3.3	2.3				156.6	8.4	5.7
180				145.7	4.7	3.3				150.6	4.9	3.4			
181	145.9	4.1	2.9				152.0	6.1	4.2				155.4	3.4	2.2
182				146.3	3.3	2.3				152.0	5.7	3.9			
183	146.8						151.6	4.8	3.3				154.8	3.2	2.1
184				146.5	4.6	3.2				151.4	4.9	3.3	155.1		
185	146.3						153.0	6.7	4.6				160.7	7.7	5.0
186				147.6	4.6	3.2	151.2								
187				148.0						156.1	8.1	5.5			
188				149.4	5.3	3.7									
189				149.3	4.8	3.3				153.2	3.9	2.6			
190	149.0						154.8	5.8	3.9				165.1	10.3	6.7
191				150.7	3.0	2.0				157.3	6.6	4.4			
192				151.2	2.9	2.0				160.5	9.3	6.2			
193				151.6	5.9	4.0				161.5	9.9	6.5			
194	151.1						156.7	5.6	3.7				162.9	6.2	4.0
195							152.1						160.2	8.1	5.3
196				152.5	5.4	3.7				155.6	3.1	2.0			
197				153.9	5.9	4.0	158.0						165.3	7.3	4.6
198				154.2	9.7	6.7				161.6	7.4	4.8			
199				155.7	6.3	4.2	160.7						169.2	8.5	5.3
200				158.5	6.5	4.3				163.4	4.9	3.1			
Average	141.2	4.2	3.0	146.3	5.2	3.6	147.9	5.0	3.4	151.1	6.0	4.0	155.0	6.4	4.2
Average var		.1			1.2			1.1			1.9			2.0	

boys with consecutive measurements from 12 to 17 years of age.

14½ years.			15 years.			15½ years.			16 years.			16½ years.			17 years.			No.
Height.	Increment, 13½–14½ years.	Per cent gain.	Height.	Increment, 14–15 years.	Per cent gain.	Height.	Increment, 14½–15½ years.	Per cent gain.	Height.	Increment, 15–16 years.	Per cent gain.	Height.	Increment, 15½–16½ years.	Per cent gain.	Height.	Increment, 16–17 years.	Per cent gain.	
Cm.	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		*Cm.*	*Cm.*		
155.6	6.6	4.4	160.2	....	....	164.5	8.9	5.7	....	....	....	168.4	3.9	2.4	170.6	....	....	151.
147.2	6.6	4.7	....	....	....	....	....	....	....	....	....	....	....	....	164.5	....	....	152.
146.3	4.3	3.0	149.0	....	....	153.4	7.1	4.9	159.0	10.0	6.7	161.5	8.1	5.3	170.0	11.0	6.9	153.
....	....	....	154.0	4.4	2.9	....	....	....	161.7	7.7	5.0	....	....	....	171.4	9.7	6.0	154.
....	....	....	158.5	5.1	3.3	....	....	....	160.5	2.0	1.3	....	....	....	161.5	1.0	.6	155.
145.3	....	....	....	....	....	150.6	5.3	3.6	154.9	....	....	160.0	9.4	6.2	165.6	10.7	6.9	156.
....	....	....	161.1	....	....	....	....	....	165.1	4.0	2.5	....	....	....	167.1	2.0	1.2	157.
....	....	....	146.2	4.6	3.2	....	....	....	153.6	7.4	5.1	....	....	....	160.9	7.3	4.8	158.
148.0	4.0	2.8	....	....	....	153.0	5.0	3.4	....	....	....	....	....	....	....	....	....	159.
153.7	....	....	....	....	....	....	....	....	165.3	....	....	....	....	....	170.5	5.2	3.1	160.
147.0	3.5	2.4	....	....	....	151.3	4.3	2.9	....	....	....	158.4	7.1	4.7	....	....	....	161.
154.9	7.9	5.4	161.1	....	....	164.2	9.3	6.0	167.7	6.6	4.1	168.9	4.7	2.9	172.9	5.2	3.1	162.
....	....	....	162.6	9.7	6.3	....	....	....	168.0	5.4	3.3	....	....	....	171.2	3.2	1.9	163.
....	....	....	164.0	8.8	5.7	....	....	....	166.9	2.9	1.8	....	....	....	169.1	2.2	1.3	164.
157.5	10.3	7.0	....	....	....	164.1	6.6	4.2	....	....	....	168.3	4.2	2.6	....	....	....	165.
162.6	6.4	4.1	....	....	....	164.6	2.0	1.2	....	....	....	....	....	....	165.8	....	....	166.
....	....	....	162.7	8.8	5.7	....	....	....	167.3	4.6	2.8	....	....	....	169.5	2.2	1.3	167.
155.6	6.6	4.4	....	....	....	162.4	6.8	4.4	....	....	....	166.5	4.1	2.5	....	....	....	168.
161.9	....	....	....	....	....	....	....	....	171.6	....	....	172.7	....	....	....	....	....	169.
....	....	....	153.2	4.8	3.2	....	....	....	158.2	5.0	3.3	....	....	....	168.2	10.0	6.3	170.
....	....	....	159.0	4.0	2.6	....	....	....	164.2	5.2	3.3	....	....	....	166.9	2.7	1.6	171.
152.9	5.2	3.5	....	....	....	163.1	10.2	6.7	....	....	....	169.2	6.1	3.7	....	....	....	172.
....	....	....	163.9	4.4	2.8	....	....	....	....	....	....	....	....	....	....	....	....	173.
155.2	5.5	3.7	....	....	....	165.7	10.5	6.8	....	....	....	171.5	5.8	3.5	....	....	....	174.
159.2	7.5	4.9	....	....	....	164.5	5.3	3.3	....	....	....	167.3	2.8	1.7	....	....	....	175.
....	6.2	4.2	....	6.1	4.0	....	6.8	4.4	....	5.5	3.6	....	5.6	3.6	....	5.6	3.5	Av.
....	1.4	....	....	2.0	....	....	2.0	....	....	1.7	....	....	1.7	....	....	3.2	....	Av.var.
153.5	....	....	158.3	9.8	6.6	166.6	13.1	8.5	167.6	9.3	5.9	....	....	....	172.7	5.1	3.0	176.
....	....	....	159.0	9.0	6.0	165.6	....	....	....	....	....	....	....	....	175.2	....	....	177.
157.2	....	....	....	....	....	....	....	....	169.2	....	....	172.0	....	....	....	....	....	178.
....	....	....	165.8	9.2	5.9	....	....	....	169.9	4.1	2.5	....	....	....	171.0	1.1	.7	179.
157.9	7.3	4.8	....	....	....	167.6	9.7	6.1	....	....	....	174.2	6.6	3.9	....	....	....	180.
....	....	....	164.1	8.7	5.6	....	....	....	173.0	8.9	5.4	....	....	....	177.9	4.9	2.8	181.
....	....	....	....	....	....	....	....	....	....	....	....	172.6	....	....	....	....	....	182.
....	....	....	158.2	3.4	2.2	....	....	....	164.7	6.5	4.1	....	....	....	173.5	8.8	5.3	183.
158.7	7.3	4.8	164.6	9.5	6.1	167.8	9.1	5.7	....	....	....	174.5	6.7	4.0	177.0	....	....	184.
....	....	....	169.8	9.1	5.7	....	....	....	175.3	5.5	3.2	....	....	....	177.4	2.1	1.2	185.
162.0	....	....	164.0	....	....	....	....	....	....	....	....	....	....	....	180.4	1.5	.8	186.
167.0	10.9	7.0	169.6	....	....	....	....	....	....	....	....	174.1	....	....	174.3	....	....	187.
167.1	....	....	....	....	....	171.3	4.2	2.5	....	....	....	173.8	2.5	1.5	....	....	....	188.
159.3	6.1	4.0	....	....	....	169.5	10.2	6.4	....	....	....	176.1	6.6	3.9	....	....	....	189.
....	....	....	173.8	8.7	5.3	....	....	....	179.0	5.2	3.0	....	....	....	181.1	2.1	1.2	190.
163.9	6.6	4.2	....	....	....	173.1	9.2	5.6	....	....	....	177.7	4.6	2.7	....	....	....	191.
168.6	2.1	1.3	....	....	....	171.1	2.5	1.5	....	....	....	176.0	4.9	2.9	....	....	....	192.
167.1	5.6	3.5	....	....	....	171.4	4.3	2.6	....	....	....	173.4	2.0	1.2	....	....	....	193.
....	....	....	172.4	9.5	5.8	....	....	....	180.4	8.0	4.6	....	....	....	183.0	2.6	1.4	194.
162.5	....	....	....	....	....	163.9	1.4	.9	....	....	....	164.9	1.0	.6	....	....	....	195.
159.5	3.9	2.5	....	....	....	166.3	6.8	4.3	....	....	....	176.0	9.7	5.8	....	....	....	196.
....	....	....	172.3	7.0	4.2	....	....	....	177.5	5.2	3.0	....	....	....	....	....	....	197.
168.2	6.6	4.1	....	....	....	170.4	2.2	1.3	....	....	....	171.0	.6	.4	....	....	....	198.
....	....	....	....	....	....	177.2	....	....	....	....	....	178.9	1.7	1.0	....	....	....	199.
168.4	5.0	3.1	....	....	....	177.5	9.1	5.4	....	....	....	182.6	5.1	2.9	....	....	....	200.
157.9	6.1	3.9	161.9	8.4	5.3	165.4	6.8	4.2	167.1	6.6	4.5	171.2	4.3	2.6	171.4	3.5	2.1	Av.
....	1.0	....	....	1.3	....	....	3.2	....	....	1.6	....	....	2.3	....	....	2.1	....	Av.var.

TABLE 15.—*Increments of growth in weight for a group of*

[Weight and increment

No.	7 years.			7½ years.			8 years.			8½ years.			9 years.			9½ years.			10 years.		
	Weight.	Increment, 6-7 years.	Per cent gain.	Weight.	Increment, 6½-7½ years.	Per cent gain.	Weight.	Increment, 7-8 years.	Per cent gain.	Weight.	Increment, 7½-8½ years.	Per cent gain.	Weight.	Increment, 8-9 years.	Per cent gain.	Weight.	Increment, 8½-9½ years.	Per cent gain.	Weight.	Increment, 8-10 years.	Per cent gain.
1	41.9						44.5	2.6	6.2				46.4	1.9	4.2	46.3			48.5	2.1	5.4
2	39.2						45.1	5.9	15.0				46.6	1.5	3.3				53.2	6.6	14.0
3	55.3						55.5	.2	.4				62.6	7.1	13.0				63.4	.8	1.3
4				40.5						46.0	5.5	13.5	48.5						54.0	5.5	11.3
5				42.0									48.5			51.8					
6				41.0						44.2	3.2	7.8	45.7			48.9	4.7	10.6			
7				44.0						46.6	2.6	5.9				47.5	.9	1.9			
8				46.2						50.6	4.4	9.5				58.7	8.1	16.0			
9				48.0						54.3	6.3	13.1				63.5	9.2	16.9			
10	51.8						55.0	3.2	6.2				61.0	6.0	11.0				64.7	3.7	6.1
11				46.0	6.5	16.5				52.3	6.3	14.0				56.0	3.7	7.1			
12	45.8			48.0						52.5	4.5	9.4				60.6	8.1	15.4			
13				46.3			47.8			50.3	4.0	8.6	52.7	4.9	10.3	54.5	4.2	8.3			
14	42.9			45.0															53.0		
15				46.5	3.5	8.1	47.8			50.1	3.6	7.7	54.3	6.5	13.6				61.0	6.7	12.3
16	43.3	6.3	1.6				46.6	3.3	7.6				51.0	4.4	9.4				57.2	6.2	12.2
17	57.5						62.3	4.8	8.4				64.8	2.5	4.0				[1]53.9	[1]9.1	[1]14.0
18				40.5	4.7	13.1				45.9	5.4	13.3				50.8	4.9	10.7			
19	44.0			44.0									51.5			52.8			52.9	1.4	2.7
20	47.0									55.3						59.5	4.2	7.6			
21	50.5						56.8	6.3	12.5	57.2						64.5			68.5		
22				48.0			52.0						57.3	5.3	10.2				61.0	3.7	6.5
23				48.0	1.0	2.1				48.8	.8	1.7				50.0	1.2	2.5	52.5		
24				55.5			61.0						62.5	1.5	2.5				72.0	9.5	15.2
25	50.0						54.5	4.5	9.0				63.6	9.1	16.6				75.3	11.7	13.4
Av.		6.3	1.6		3.9	10.0		3.9	8.2		4.2	10.4		4.6	8.9		4.9	9.7		5.6	10.0
Av. var.		.0			1.7			1.5			1.3			1.9			2.1			2.7	
26	45.3						49.5	4.2	9.3				55.7	6.2	12.5				61.2	5.5	9.9
27				50.3			48.0			51.0	.7	1.4	51.2	3.2	6.7	55.3	4.3	8.4			
28	55.1			55.0			51.3	−3.8	−6.9				62.3	11.0	21.4	64.5			66.1		
29				46.0						50.5	4.5	9.8				58.0	7.5	14.9	63.5		
30	48.5						54.0	5.5	11.3				57.0	3.0	5.6				68.0	11.0	19.3
31				51.5	3.2	6.6				59.5	8.0	15.5				66.0	6.5	10.9			
32	52.3						53.5	1.2	2.3				57.6	4.1	7.7	61.0					
33				53.0	4.7	9.7				67.5	14.5	27.4				74.4	6.9	10.2			
34	54.0						60.6	6.6	12.2	63.0						66.0	3.0	4.8			
35				42.5			49.6						56.5	6.9	13.9				61.6	5.1	9.0
36				53.5	3.7	7.4				58.0	4.5	8.4				62.5	4.5	7.8	70.2		
37				50.5			55.5						62.0	6.5	11.8				67.7	5.7	9.2
38				53.5						58.7	5.2	9.7				66.6	7.9	13.4			
39				63.0						72.3	9.3	14.8				83.9	11.6	14.6			
40	56.3												67.8						71.0	3.2	4.7
41	52.9			52.9			59.5	6.6	12.5	61.7	8.8	16.6	64.0	4.5	7.6				67.7	3.7	5.8
42				52.5						60.0	7.5	14.3				72.0	12.0	20.0			
43	52.9			59.4			58.0	5.1	9.6				60.0	2.0	3.4				63.8	3.8	6.3
44				58.0			62.7			63.9	5.9	10.2	67.2	4.5	7.2				76.6	9.4	14.0
45				52.2	3.4	7.0				57.6	5.4	10.3				62.7	5.1	8.9			
46				67.5	4.0	6.3				76.0	8.5	12.6				88.0	12.0	15.8			
47				56.8						67.5	10.7	18.8				81.2	13.7	20.3			
48				48.8	2.8	6.1	50.5			51.8	3.0	6.2	55.3	4.8	9.5	57.1	5.3	10.2			
49	54.5						59.5	5.0	9.2				77.7	18.2	30.6				85.4	7.7	9.8
50	69.0			72.6	8.5	13.1	79.7	10.7	15.5	83.0	10.4	14.3							101.0		
Av.	50.5			50.5	4.3	8.0	54.7	4.6	8.3	57.1	7.1	12.8	57.5	6.2	11.5	61.5	7.7	12.4	64.8	6.1	10.9
Av. var.					1.3			2.6			2.7			2.9			2.9			2.2	

[1] Decrease.

50 girls with consecutive measurements, from 7 to 13 years of age.

expressed in pounds.]

10½ years.			11 years.			11½ years.			12 years.			12½ years.			13 years.			
Weight.	Increment, 9½–10½ years.	Per cent gain.	Weight.	Increment, 10–11 years.	Per cent gain.	Weight.	Increment, 10½–11½ years.	Per cent gain.	Weight.	Increment, 11–12 years.	Per cent gain.	Weight.	Increment, 11½–12½ years.	Per cent gain.	Weight.	Increment, 12–13 years.	Per cent gain.	No.
51.4	5.1	1.1				57.0	5.6	10.9	62.8			65.5	8.5	14.9	74.5	11.7	18.6	1.
			56.5	3.3	6.2				68.6	12.1	21.4				77.2	8.6	12.5	2.
			83.6	20.2	30.3				82.9	−.7	−.8				84.7	1.8	2.2	3.
			58.0	4.0	7.4				65.3	7.3	12.6				76.6	11.3	17.3	4.
57.3	5.5	10.6				64.0	6.7	11.7				76.6	12.6	19.7				5.
48.8	−.1	−2.0							59.5						64.0	4.5	7.6	6.
57.7	10.2	21.5				55.0	−2.7	−4.7										7.
64.5	5.8	9.9				83.2	18.7	28.9				90.4	7.2	8.6				8.
68.2	4.7	7.4				75.2	7.1	10.4				85.4	10.2	10.3				9.
			74.4	9.7	15.0				82.9	8.5	11.4				84.2	1.3	1.6	10.
60.5	4.5	8.0				68.4	7.9	13.1				78.8	10.4	15.2				11.
						78.1												12.
61.0	6.5	12.0	59.0			63.8	2.8	4.6	72.5	13.5	2.3	74.5	10.7	15.2	85.0	12.5	17.2	13.
55.1			60.5	7.5	14.2				65.5	5.0	8.3				74.9	9.4	14.4	14.
			65.5	4.5	7.4	71.8			82.3	16.8	25.6	85.3	13.5	18.8	95.0	12.7	15.4	15.
			64.5	7.3	12.8				72.4	7.9	12.2				86.9	14.5	20.0	16.
			77.2	23.3	43.2				86.2	9.0	11.6							17.
56.9	6.1	12.0				64.0	7.1	12.5				75.9	11.9	18.6				18.
57.9	5.1	9.7	58.8	5.9	11.2				70.0	11.2	19.0	73.5			81.3	11.3	16.1	19.
73.0			84.0						100.1						117.2			20.
69.5	5.0	7.7	74.5	6.0	8.8	77.8	8.3	11.9	84.8	10.3	13.8	87.5	9.7	12.5	102.8	18.0	21.2	21.
			71.1	10.1	16.6				79.2	8.1	11.4				89.3	10.1	12.7	22.
			62.0	9.5	18.1				71.1	9.1	14.7				85.9	14.8	20.9	23.
			76.1	4.1	5.7				79.8	3.7	4.9				102.7	22.9	28.6	24.
			84.0	8.7	11.4	98.6			101.4	17.4	20.7				116.6	15.2	14.9	25.
	5.3	8.9		8.9	14.3		6.8	11.0		9.5	2.6		10.5	14.9		11.4	15.2	Av.
	1.4			4.2			3.3			3.7			1.5			4.2		Av. var.
			67.1	6.0	9.8				78.8	11.7	17.4				95.7	16.9	21.4	26.
59.5	4.2	7.6	61.0									68.2			69.9			27.
72.8	8.3	12.9	83.1	17.0	25.7				87.5	4.4	5.3	92.3			95.2	7.7	8.9	28.
			71.5	8.0	12.6				82.3	10.8	15.1				101.2	18.9	23.0	29.
			81.5	13.5	19.9				94.2	12.7	15.6	106.9						30.
75.0	9.0	13.6				81.4	6.4	8.5				88.4	7.0	8.6				31.
70.6	9.6	15.7	73.0						86.4	13.4	18.4	96.0						32.
76.8	2.4	3.2				91.7	14.9	19.4				98.5	6.8	7.4				33.
75.0	9.0	13.6				86.0	11.0	14.7				99.0	13.0	15.1				34.
			63.8	2.2	3.6				75.2	11.4	17.9				78.3	3.1	4.1	35.
			73.5	3.3	4.7	76.5						87.3	10.8	14.1	90.4			36.
			73.7	6.0	8.9				81.6	7.9	10.7				91.0	9.4	11.5	37.
71.1	4.5	6.8				87.6	16.6	23.3				103.8	16.2	18.5				38.
95.3	11.4	13.6										127.6						39.
			77.4	6.4	9.0				85.4	8.0	10.3				92.8	7.4	8.7	40.
72.0			75.3	7.6	11.2	82.0	10.0	13.9	86.2	10.9	14.5				101.8	15.6	18.1	41.
73.0	1.0	1.4				85.4	12.4	17.0				95.0	9.6	11.2				42.
			68.6	5.2	8.2				82.5	13.9	20.3	89.0						43.
			85.8	9.2	2.0	92.8			97.5	11.7	12.6	99.7	6.9	7.4				44.
71.0	8.3	13.2				80.5	9.5	13.4				88.4	7.9	9.8				45.
99.2	11.2	12.7				116.1	16.9	17.0				121.7	5.6	4.8				46.
94.2	13.0	16.1				104.5	10.3	10.9				124.9	20.4	19.5				47.
59.5	2.4	4.2	63.5			64.0	4.5	7.6	71.8	8.3	13.1							48.
			94.6	9.2	10.8				104.1	9.5	10.0				117.0	12.9	11.0	49.
						137.6			147.9									50.
68.4	7.2	10.4	71.7	7.8	10.5	74.9	11.3	14.6	82.8	10.3	13.9	91.5	10.4	11.6	90.5	11.5	13.3	Av.
	3.4			3.0			3.2			2.1			3.7			4.4		Av. var.

TABLE 16.—*Increments of growth in weight for a group of 50*

[Weight and increment

No.	12 years.			12½ years.			13 years.			13½ years.			14 years.			14½ years.		
	Weight.	Increment, 11–12 years.	Per cent gain.	Weight.	Increment, 11½–12½ years.	Per cent gain.	Weight.	Increment, 12–13 years.	Per cent gain.	Weight.	Increment, 12½–13½ years.	Per cent gain.	Weight.	Increment, 13–14 years.	Per cent gain.	Weight.	Increment, 13½–14½ years.	Per cent gain.
51	49.8			53.0						60	7.0	13.2				72.5	12.5	20.8
52	77.0	8.5	12.4				88.4	11.4	14.8				97.9	9.5	10.7	80.7	16.7	26.1
53				57.0						64.0	7.0	12.3						
54				60.0	5.0	9.1	65.5						78.0	12.5	19.1			
55				58.0	4.5	8.4	60.3						69.0	8.7	14.4	92.8	5.8	6.6
56	66.8	2.3	3.6	70.5						87.0	16.5	23.4				80.5	[1]6.5	[1]7.5
57	61.7	6.7	12.2	68.3	16.6	10.7	63.7	2.0	3.2				73.7	10.0	15.7	101.6	11.0	12.0
58				76.3	14.8	24.1				90.6	14.3	18.6						
59	71.0	9.7	15.8				85.0	14.0	19.7				90.0	5.0	5.5			
60	83.0	4.4	5.6				92.5	9.5	11.4	107.5						118.2	10.7	10.3
61	110.0	13.5	14.0				122.8	12.8	11.6				132.0	9.2	7.5			
62	64.7	3.7	6.1	69.9	2.8	4.2				84.0	14.1	20.2	88.1					
63	64.8						77.3	12.5	19.3	83.8			85.9	8.6	11.1	90.9	7.1	8.4
64	65.5	10.4	18.9				79.0	13.5	20.6	85.5			90.4	11.4	14.4	93.0	7.5	8.7
65				73.3	5.3	7.8	80.5						94.0	13.5	16.7			
66	79.8	11.5	16.8				94.5	14.7	18.4	107.8			113.8	19.3	20.5	126.5	18.7	17.3
67										104.0			111.3					
68	70.0	3.5	5.3	75.0						82.0	7.0	9.3				102.9	20.9	25.5
69	73.0									82.5						94.0	11.5	13.8
70				78.1	7.7	10.9				98.1	20.0	25.6				110.0	11.9	12.1
71	79.5						92.8	13.3	16.7				110.0	17.2	18.3			
72	76.0	5.0	7.0				86.9	10.9	14.3				96.4	9.5	10.9			
73	95.0	17.0	21.8				107.8	12.8	13.5				116.2	8.4	7.7	111.8	− .7	− .6
74				104.0						112.5	8.5	8.1						
75	88.0	13.0	17.3				96.8	8.8	10.0				102.6	5.8	5.9			
Av		18.4	12.1		8.1	10.7		11.4	14.4		11.8	16.4		10.6	12.7		9.8	1.8
Av. var		3.8			4.3			2.4			4.4			3.0			5.5	
76	80.3						95.5	15.2	18.9				107.4	11.9	12.5			
77	72.3	6.3	9.5				83.8	11.5	15.9				90.2	6.4	7.6			
78	66.6	7.6	12.9				75.5	8.9	13.4	84.3						97.0	12.7	15.0
79				78.0	10.0	14.7				90.4	12.4	15.9				102.7	12.3	13.6
80				76.8	10.7	16.2				79.4	2.6	3.4	83.7			86.0	6.6	8.3
81	100.3						104.0	3.7	3.6				126.0	22.0	21.1			
82	67.8	3.9	6.1				83.0	15.2	22.4	86.5			91.6	8.6	10.4	99.8	13.3	15.3
83	69.4	9.6	16.1				77.2	7.8	11.2	85.6			89.9	12.7	16.4			
84	97.0						119.0	22.0	22.7				127.2	8.2	6.9			
85	66.7												83.0			85.7		
86	79.3	6.3	8.6				93.2	13.9	17.5				103.4	10.2	10.9			
87				73.5	4.7	6.8	81.8						96.5	14.7	17.9			
88							109.3						123.6	14.3	13.0	123.0		
89	79.5	4.0	5.3				90.4	10.9	13.7							103.5		
90				86.5	12.0	16.1				104.9	18.4	21.3				120.6	15.7	14.9
91				88.3						105.5	17.2	19.4	107.8			121.3	15.8	15.9
92	92.8	10.8	13.2				104.8	12.0	12.0				115.0	10.2	9.7	120.0		
93	117.0			120.5			123.3	6.3	5.4	119.5	−1.0	− .8	125.8	2.5	2.0			
94				102.3	20.3	24.8				101.5	− .8	− .7	118.0					
95	94.0	18.7	9.4				105.4	11.4	12.1				116.4	11.0	10.4			
96	96.5	8.3	9.4				109.3	12.8	13.3	114.8			112.4	3.1	2.8	115.9	1.1	1.0
97	83.8						98.0	14.2					112.2	14.2	14.4			
98				127.0						147.8	20.8	16.4				162.1	14.3	9.6
99				105.5	11.2	11.9				110.2	4.7	4.6				111.5	1.3	1.1
100				103.3	11.3	12.3				124.3	21.0	20.3				135.0	10.7	8.6
Av	79.3	8.4	10.1	82.	11.5	14.7	91.8	11.8	14.0	96.4	11.8	11.3	102.3	10.7	11.1	105.8	10.4	10.3
Av. var		3.1			2.9			3.2			8.1			3.7			4.4	

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[1] Decrease.

***girls** with consecutive measurements, from 12 to 17 years of age.*

expressed in pounds.]

15 years.			15½ years.			16 years.			16½ years.			17 years.			
Weight.	Increment, 14–15 years.	Per cent gain.	Weight.	Increment, 14½–15½ years.	Per cent gain.	Weight.	Increment, 15–16 years.	Per cent gain.	Weight.	Increment, 15½–16½ years.	Per cent gain.	Weight.	Increment, 16–17 years.	Per cent gain.	No.
......	......	......	73.0	0.5	0.6	77.4	......	......	80.3	7.3	10.0	......	......	......	51.
117.3	19.4	19.8	......	......	......	121.0	3.7	3.2	......	......	......	122.3	1.3	1.1	52.
......	......	......	87.6	6.9	8.5	......	......	......	......	......	......	103.4	......	......	53
97.2	19.2	24.5	......	......	......	101.2	4.0	4.1	......	......	......	99.9	−1.3	−1.3	54.
79.6	10.6	15.4	......	......	......	84.9	5.3	6.6	......	......	......	93.0	8.1	9.5	55.
......	......	......	104.0	11.2	12.0	......	......	......	115.5	11.5	11.0	......	......	......	56.
85.9	12.2	16.5	87.2	6.7	8.3	97.0	11.1	12.6	......	......	......	100.0	3.0	3.3	57.
......	......	......	103.8	2.2	2.1	......	......	......	111.3	7.5	7.2	......	......	......	58.
93.5	3.5	3.1	......	......	......	90.2	− 3.3	−3.5	......	......	......	94.4	4.2	4.6	59.
......	......	......	118.3	.1	.1	......	......	......	115.2	− 3.1	−2.6	......	......	......	60.
145.9	13.9	10.5	......	......	......	144.1	− 1.8	−1.3	......	......	......	......	......	......	61.
98.0	9.9	10.1	103.5	......	......	......	......	......	112.5	9.0	8.6	114.2	......	......	62.
96.2	10.3	11.9	......	......	......	100.5	4.3	4.4	98.5	......	......	......	......	......	63.
97.4	7.0	7.7	......	......	......	106.0	8.6	8.8	107.0	......	......	112.3	6.3	5.9	64.
95.0	1.0	1.1	......	......	......	100.1	5.1	5.3	......	......	......	97.2	−2.9	−2.8	65.
123.8	10.0	8.7	132.3	5.8	4.6	136.3	12.5	10.0	140.0	7.7	5.8	148.0	11.7	8.6	66.
......	......	......	111.7	......	......	......	......	......	117.2	5.5	4.9	......	......	......	67.
......	......	......	113.3	10.4	10.1	......	......	......	126.0	12.7	11.2	......	......	......	68.
104.8	......	......	......	......	......	113.2	9.4	8.9	......	......	......	113.9	.7	.6	69.
......	......	......	111.1	1.1	1.0	......	......	......	113.3	2.2	2.0	......	......	......	70.
115.5	5.5	5.0	......	......	......	127.2	11.7	10.1	......	......	......	127.2	.0	.0	71.
111.5	15.1	15.6	......	......	......	112.6	1.1	.9	......	......	......	117.9	5.3	4.7	72.
113.0	−3.2	−2.7	......	......	......	112.4	− .6	− .5	......	......	......	107.4	−5.0	−4.4	73.
......	......	......	131.1	19.3	10.7	......	......	......	121.0	−10.1	−7.7	......	......	......	74.
109.1	6.5	6.3	......	......	......	112.9	2.7	2.4	......	......	......	119.2	6.4	5.6	75.
......	9.4	10.2	......	6.4	5.8	......	4.9	4.8	......	5.0	5.0	......	2.9	2.7	Av.
......	4.8	......	......	4.5	......	......	3.9	......	......	5.2	......	......	3.8	......	Av. **var.**
119.2	11.8	10.9	......	......	......	125.0	5.8	4.8	......	......	......	128.3	3.3	2.6	76.
106.9	16.7	88.4	......	......	......	......	......	......	......	......	......	118.8	......	......	77.
100.8	......	......	105.7	8.7	8.9	103.3	2.5	2.5	104.8	− .9	− .8	......	......	......	78.
......	......	......	110.2	7.5	7.3	......	......	......	120.6	10.4	9.4	......	......	......	79.
......	......	......	106.0	20.0	23.2	......	......	......	116.3	10.3	9.7	......	......	......	80.
138.3	12.3	9.8	132.6	......	......	125.4	−12.9	−9.7	......	......	......	134.9	9.4	7.5	81.
103.2	11.6	12.6	......	......	......	104.0	.8	7.7	103.5	......	......	105.5	1.5	1.5	82.
100.8	10.9	12.1	......	......	......	109.6	8.8	8.7	......	......	......	119.2	9.6	8.7	83.
130.7	3.5	2.7	......	......	......	124.7	− 6.0	−4.5	......	......	......	119.2	−5.5	−4.3	84.
91.2	8.2	9.9	......	......	......	......	......	......	100.7	......	......	......	......	......	85.
110.6	7.2	7.5	......	......	......	123.8	13.2	11.9	......	......	......	127.1	3.3	2.7	86.
103.0	6.5	6.7	......	......	......	108.0	5.0	4.8	......	......	......	109.1	1.1	1.0	87.
123.5	− .1	− .1	126.9	3.9	3.2	......	......	......	133.0	6.1	4.8	132.0	......	......	88.
104.0	......	......	......	......	......	113.0	9.0	8.6	......	......	......	121.3	8.3	7.3	89.
......	......	......	119.9	− .7	− .6	......	......	......	125.0	5.1	4.2	129.5	......	......	90.
123.1	15.3	14.2	127.8	6.5	5.3	......	......	......	131.0	3.2	2.5	......	......	......	91.
......	......	......	......	......	......	127.3	......	......	128.0	......	......	......	......	......	92.
......	......	......	......	......	......	137.5	......	......	135.0	......	......	137.0	......	......	93.
126.7	8.7	7.4	......	......	......	......	......	......	139.0	......	......	......	......	......	94.
124.5	8.1	6.9	124.3	......	......	......	......	......	130.9	6.6	5.3	120.5	−3.0	−2.5	95.
121.3	8.9	7.9	124.9	9.0	7.7	123.5	2.2	1.8	116.3	− 6.6	5.3	139.3	15.8	11.8	96.
126.0	13.8	12.3	......	......	......	133.1	7.1	5.6	......	......	......	......	......	......	97.
......	......	......	167.9	5.8	3.6	......	......	......	180.4	12.5	7.4	......	......	......	98.
......	......	......	111.5	.0	.0	......	......	......	121.7	10.2	9.1	......	......	......	99.
......	......	......	133.5	−1.5	−1.1	......	......	......	129.8	− 3.7	−2.7	......	......	......	100.
110.2	9.6	9.3	115.3	5.9	5.8	113.6	3.2	3.9	116.9	4.8	4.9	117.7	4.4	3.6	Av.
......	3.4	......	......	4.4	......	......	5.9	......	......	5.0	......	......	5.1	......	Av. var.

TABLE 17.—*Increments of growth in weight for a group of 50*

[Weight and increment

No.	7 years.			7½ years.			8 years.			8½ years.			9 years.			9½ years.			10 years.		
	Weight.	Increment, 6–7 years.	Per cent gain.	Weight.	Increment, 6½–7½ years.	Per cent gain.	Weight.	Increment, 7–8 years.	Per cent gain.	Weight.	Increment, 7½–8½ years.	Per cent gain.	Weight.	Increment, 8–9 years.	Per cent gain.	Weight.	Increment, 8½–9½ years.	Per cent gain.	Weight.	Increment, 9–10 years.	Per cent gain.
101	42.5						48.4	5.9	13.9	47.1			51.4	3.0	6.2	53.0	5.9	12.5	54.3	2.9	5.6
102				38.6						43.0	4.4	11.4				44.3	1.3	3.0			
103	41.8	3.3	8.6				44.4	2.6	6.2				49.1	4.7	10.6				53.0	3.9	7.9
104				43.0	3.5	8.9				45.4	2.4	5.6				50.7	5.3	11.7			
105				46.2						49.7	3.5	7.6				56.1	6.4	12.9			
106	37.5						42.3	4.8	12.8				46.0	3.7	8.7				48.7	2.7	5.9
107				46.3						44.0	−2.3	−5.0				49.3	5.3	12.0			
108							45.0						50.5	5.5	12.2				54.8	4.3	8.5
109	44.4			46.3	2.3	5.2	46.3	1.9	4.3	47.4	1.1	2.4				53.0	5.6	11.8	54.8		
110							48.5						53.0	4.5	9.3				62.2	9.2	17.4
111				41.8			46.8						52.1	5.3	11.3				55.2	3.1	6.0
112	43.0	4.7	12.3				47.5	4.5	10.5				52.6	5.1	10.7				57.6	5.0	9.5
113	47.5						52.3	4.8	10.2				57.8	5.5	10.5	51.8					
114	42.0	5.5	15.1				47.5	5.5	13.1				53.0	5.5	11.6				57.2	4.2	7.9
115				47.8	6.8	16.6				53.5	5.7	11.9				58.0	4.5	8.4			
116	47.0						52.0	5.0	10.6				63.3	11.3	21.7				66.5	3.2	5.0
117	41.9						44.1	2.2	5.3										51.5		
118				47.0	2.0	4.4				51.0	4.0	8.5				54.5	3.5	6.9	59.9		
119				53.9						57.2	3.3	6.1				62.0	4.8	8.4			
120				46.0	6.0	15.0				48.8	2.8	6.1				53.9	5.1	10.5			
121				44.0						48.0	4.0	9.1				51.7	3.7	7.7			
122	48.0									52.0						55.0	3.0	5.8			
123				44.5						40.5	5.0	11.2				54.6	5.1	10.3			
124				49.6	3.1	6.7				56.8	7.2	14.5	57.7			59.4	2.6	4.6			
125							58.3						67.1	8.8	15.1				74.0	6.9	10.3
Av.		4.5	12.0		4.0	9.5		4.1	9.7		3.4	7.5		5.7	11.6		4.4	9.0		4.5	8.5
Av.var		.8			1.7			1.3			1.6			1.6			1.2			1.5	
126	53.0						62.0	9.0	17.0				65.5	3.5	5.6				80.0	14.5	22.1
127	50.8						53.0	2.2	4.3				59.5	6.5	12.3				66.0	6.5	10.9
128	49.0						57.0	8.0	16.3				65.4	8.4	14.7				72.5	7.1	10.9
129				56.8						64.0	7.2	12.7				69.9	5.9	9.2			
130	57.3			61.5									65.4			63.0			71.4	6.0	9.2
131	55.0									60.0						67.5	7.5	12.5			
132				52.0									58.0			59.3					
133	65.6						76.0	10.4	15.9				80.5	4.5	5.9	87.3					
134				48.5			57.8														
135				49.1						58.7	9.6	19.6				62.3	3.6	6.1			
136				50.8	7.0	16.0	53.0						58.0	5.0	9.4				65.1	7.1	12.2
137				55.2									57.2			60.0					
138	51.7						57.4	5.7	11.0				65.8	8.4	14.6				74.6	8.8	13.4
139				54.5			63.8						66.7	2.9	4.5	62.5					
140				56.8						63.6	6.8	12.0				70.2	6.6	10.4			
141				55.5						62.4	6.9	12.4				67.7	5.3	8.5			
142				59.5	3.2	5.7	69.1			76.2	16.7	28.1							93.3		
143	49.0			55.1						65.0	9.2	16.5							72.8		
144				53.0						62.0	6.0	10.7				70.0	8.0	12.9			
145				55.3	4.3	8.4				63.5	8.2	14.8				70.0	6.5	10.2			
146	61.6						70.6	9.0	14.6				79.6	9.0	12.7	80.7			88.7	9.1	11.4
147	63.0	8.0	14.5				65.5	2.5	4.0				72.5	7.0	10.7				83.2	10.7	14.8
148	55.0			57.0									63.5			67.5			70.2	6.7	10.6
149				69.0						74.0	5.0	7.2				84.0	10.0	13.5			
150	77.0	14.5	23.2				72.1	−4.9	−6.4										84.3		
Av.	43.9	11.3	18.9	51.3	4.8	10.0	54.2	5.2	9.6	55.9	8.4	14.9	60.4	6.1	10.0	62.1	6.7	10.4	66.9	8.5	12.8
Av.var		3.3			1.4			4.0			2.3			1.9			1.4			2.0	

boys with consecutive measurements, *from 12 to 17 years of age.*

expressed in pounds.]

14½ years.			15 years.			15½ years.			16 years.			16½ years.			17 years.			No.
Weight.	Increment, 13½–14½ years.	Per cent gain.	Weight.	Increment, 14–15 years.	Per cent gain.	Weight.	Increment, 14½–15½ years.	Per cent gain.	Weight.	Increment, 15–16 years.	Per cent gain.	Weight.	Increment, 15½–16½ years.	Per cent gain.	Weight.	Increment, 16–17 years.	Per cent gain.	
96.5	9.0	10.3	105.5	.....	.....	115.2	18.7	19.5	.....	.....	.....	124.5	9.3	8.1	.....	.....	.....	151.
90.5	13.3	17.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	180.9	.....	.....	152.
76.0	8.9	13.1	79.5	.....	.....	91.0	15.0	19.7	96.0	16.5	20.8	102.0	11.0	12.1	110.0	14.0	14.6	153.
.....	.....	.....	96.4	12.1	14.4	.....	.....	.....	111.3	14.9	15.5	.....	.....	.....	128.5	17.2	15.5	154.
.....	.....	.....	102.1	9.9	10.7	.....	.....	.....	115.5	13.4	13.1	.....	.....	.....	117.7	2.2	1.9	155.
76.0	.....	.....	.....	.....	.....	84.7	8.7	11.4	90.0	.....	.....	101.5	16.8	19.8	112.5	22.5	25.0	156.
.....	.....	.....	112.5	.....	.....	118.0	.....	.....	131.7	19.2	17.1	.....	.....	.....	135.5	3.8	2.9	157.
.....	.....	.....	76.1	4.5	6.3	.....	.....	.....	90.9	14.8	19.4	.....	.....	.....	103.4	12.5	13.8	158.
91.5	4.9	5.6	.....	.....	.....	100.5	9.0	9.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	159.
80.0	.....	.....	.....	.....	.....	.....	.....	.....	101.8	.....	.....	.....	.....	.....	106.5	4.7	4.6	160.
89.1	7.3	8.9	.....	.....	.....	94.6	5.5	6.2	.....	.....	.....	109.8	15.2	16.1	.....	.....	.....	161.
87.7	21.2	27.7	104.3	.....	.....	112.8	25.1	28.6	122.5	18.2	17.4	128.0	15.2	12.4	135.0	12.5	10.2	162.
.....	.....	.....	98.3	14.9	17.9	.....	.....	.....	112.6	14.3	14.5	.....	.....	.....	121.7	9.1	8.2	163.
.....	.....	.....	105.5	8.0	8.2	.....	.....	.....	127.6	22.1	20.9	.....	.....	.....	134.2	6.6	5.2	164.
102.7	14.7	16.8	.....	.....	.....	118.8	16.1	15.7	.....	.....	.....	129.8	11.0	9.3	.....	.....	.....	165.
110.7	15.0	15.7	.....	.....	.....	115.2	4.5	4.1	.....	.....	.....	.....	.....	.....	122.1	.....	.....	166.
.....	.....	.....	103.8	16.2	18.5	.....	.....	.....	113.3	9.5	9.2	.....	.....	.....	123.6	10.3	9.1	167.
93.5	13.6	17.0	.....	.....	.....	106.3	12.8	13.7	.....	.....	.....	115.7	9.4	8.8	.....	.....	.....	168.
108.8	.....	.....	.....	.....	.....	.....	.....	.....	125.5	.....	.....	126.5	.....	.....	.....	.....	.....	169.
.....	.....	.....	99.2	7.4	8.1	.....	.....	.....	95.0	−4.2	−4.2	.....	.....	.....	130.2	35.2	37.1	170.
.....	.....	.....	105.8	−1.2	−1.1	.....	.....	.....	114.4	8.6	8.1	.....	.....	.....	122.9	8.5	7.4	171.
95.3	13.0	15.8	.....	.....	.....	117.0	21.7	22.8	.....	.....	.....	141.7	24.7	21.1	.....	.....	.....	172.
.....	.....	.....	120.6	12.6	11.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	173.
82.9	7.7	10.2	.....	.....	.....	104.5	21.6	26.1	.....	.....	.....	117.0	12.5	12.0	.....	.....	.....	174.
103.6	14.9	16.8	.....	.....	.....	111.5	7.9	7.6	.....	.....	.....	120.3	8.8	7.9	.....	.....	.....	175.
.....	12.0	14.6	.....	9.4	10.5	.....	13.9	15.4	.....	13.4	13.8	.....	3.4	12.7	.....	12.2	11.9	Av.
.....	3.7	.....	.....	4.3	.....	.....	5.8	.....	.....	4.8	.....	.....	3.7	.....	.....	5.5	.....	Av. **var.**
93.2	.....	.....	105.2	23.2	28.3	117.5	24.3	26.1	120.4	15.2	14.4	.....	.....	.....	127.5	7.1	5.9	176.
.....	.....	.....	108.0	14.3	15.3	118.0	.....	.....	.....	.....	.....	.....	.....	.....	138.5	.....	.....	177.
88.0	.....	.....	.....	.....	.....	.....	.....	.....	102.9	.....	.....	119.4	.....	.....	.....	.....	.....	178.
.....	.....	.....	123.9	20.3	19.6	.....	.....	.....	136.6	12.7	10.3	.....	.....	.....	140.1	3.5	2.6	179.
80.5	10.7	15.3	.....	.....	.....	97.9	17.4	21.6	.....	.....	.....	111.5	13.6	13.9	.....	.....	.....	180.
.....	.....	.....	103.0	16.3	18.8	.....	.....	.....	121.2	18.2	17.8	.....	.....	.....	130.9	9.7	8.0	181.
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	110.8	.....	.....	.....	.....	.....	182.
.....	.....	.....	92.5	5.5	6.3	.....	.....	.....	108.7	16.2	17.5	.....	.....	.....	118.1	9.4	8.6	183.
92.5	9.4	11.3	104.2	16.7	19.1	109.7	17.2	18.9	.....	.....	.....	122.8	13.1	11.9	128.5	.....	.....	184.
.....	.....	.....	129.4	18.5	16.7	.....	.....	.....	143.0	13.6	10.5	.....	.....	.....	146.0	3.0	2.1	185.
92.9	.....	.....	97.9	.....	.....	.....	.....	.....	113.9	16.0	16.3	.....	.....	.....	130.5	16.6	14.6	186.
107.0	17.0	18.9	110.6	.....	.....	.....	.....	.....	.....	.....	.....	133.8	.....	.....	134.6	.....	.....	187.
118.1	.....	.....	.....	.....	.....	130.5	12.4	10.5	.....	.....	.....	138.8	8.3	6.4	.....	.....	.....	188.
94.4	8.8	10.3	.....	.....	.....	117.5	23.1	24.5	.....	.....	.....	128.4	10.9	9.3	.....	.....	.....	189.
.....	.....	.....	102.8	15.2	17.4	.....	.....	.....	109.4	6.6	6.4	.....	.....	.....	109.8	.4	.4	190.
108.0	12.3	12.9	.....	.....	.....	132.0	24.0	22.2	.....	.....	.....	139.7	7.7	5.8	.....	.....	.....	191.
112.9	11.8	11.7	.....	.....	.....	130.5	17.6	15.6	.....	.....	.....	141.9	11.4	8.7	.....	.....	.....	192.
123.5	8.7	7.6	.....	.....	.....	137.9	14.4	11.7	.....	.....	.....	155.7	17.8	12.9	.....	.....	.....	193.
.....	.....	.....	124.3	17.4	16.3	.....	.....	.....	146.9	22.6	18.2	.....	.....	.....	152.0	5.1	3.5	194.
98.4	.....	.....	.....	.....	.....	100.5	2.1	2.1	.....	.....	.....	98.5	−2.0	−2.0	.....	.....	.....	195.
128.7	15.7	13.9	.....	.....	.....	133.1	4.4	3.4	.....	.....	.....	153.5	20.4	15.4	.....	.....	.....	196.
.....	.....	.....	110.6	12.1	12.3	.....	.....	.....	118.8	8.2	7.4	.....	.....	.....	.....	.....	.....	197.
123.2	12.5	11.3	.....	.....	.....	124.3	1.1	.9	.....	.....	.....	128.7	4.4	3.6	.....	.....	.....	198.
.....	.....	.....	.....	.....	.....	156.2	.....	.....	.....	.....	.....	158.6	2.4	1.6	.....	.....	.....	199.
111.2	8.8	8.6	.....	.....	.....	132.9	21.7	19.5	.....	.....	.....	146.7	13.8	10.4	.....	.....	.....	200.
98.5	11.6	10.1	104.9	16.0	17.0	115.4	15.0	14.8	115.4	14.3	13.2	127.1	10.2	8.2	128.5	7.9	5.7	Av.
.....	2.3	.....	.....	3.3	.....	.....	6.7	.....	.....	3.6	.....	.....	5.0	.....	.....	3.9	.....	Av. var.

TABLE 18.—*Increments of growth in weight for a group of 50*

[Weight and increment

No.	12 years.			12½ years.			13 years.			13½ years.			14 years.		
	Weight.	Increment, 11–12 years.	Per cent gain.	Weight.	Increment, 11½–12½ years.	Per cent gain.	Weight.	Increment, 12–13 years.	Per cent gain.	Weight.	Increment, 12½–13½ years.	Per cent gain.	Weight.	Increment, 13–14 years.	Per cent gain.
151	64.8			66.3						87.5	21.2	32.0			
152	67.0						72.0	5.0	7.5	77.2					
153	61.0			61.9			68.2	7.2	11.8	68.1	6.2	10.0			
154	66.0						83.0	17.0	25.8				84.3	1.3	1.6
155	62.0	5.7	10.1				75.9	13.9	22.4				92.2	16.3	21.5
156				64.0			68.0						75.7	7.7	11.3
157	72.8	1.7	2.4				80.1	7.3	10.0						
158							68.1						71.6	3.5	5.1
159	74.5						81.8	7.3	9.8	86.6					
160	62.0						67.5	5.5	8.9				73.3	5.8	8.6
161				75.4						81.8	6.4	8.5			
162				67.4	—0.4	—0.6				76.5	9.1	13.5			
163	58.6	.3	.5				68.0	9.4	16.0				83.4	15.4	22.6
164	77.0						85.0	8.0	10.4				97.5	12.5	14.7
165				77.1	8.2	11.9				88.0	10.9	14.1			
166	70.0	3.0	4.4				84.0	14.0	20.0	95.7					
167				71.6	3.1	4.5				80.5	8.9	12.4	87.6		
168	70.5			74.0						79.9	5.9	8.0			
169	74.0						81.5	7.5	10.1				93.5	12.0	14.7
170				79.8	4.3	5.7	86.4						91.8	5.4	6.3
171	82.0						90.5	8.5	10.4				107.0	16.5	18.2
172				78.9	9.1	13.0				82.3	3.4	4.4			
173				76.0	1.5	2.0	87.1						108.0	20.9	24.0
174				66.7	3.9	6.2				75.2	8.[illegible]	12.7			
175				77.0	8.6	12.6				88.7	11.7	15.2			
Av.		2.7	4.4		4.8	6.9		9.2	13.6		9.2	13.1		10.7	13.5
Av. var		1.7			2.9			2.9			3.2			5.4	
176	68.5						76.5	8.0	11.7				82.0	5.5	7.2
177	75.0			79.0			80.1	5.1	6.8	80.3	1.3	1.6	93.7	13.6	16.9
178	73.0						75.0	2.0	2.7				82.5	7.5	10.0
179	77.8	6.3	8.8				85.9	8.1	10.4				103.6	17.7	20.6
180				61.7	4.9	8.6				69.8	8.1	13.1			
181	72.4	7.1	10.9				77.9	5.5	7.6				86.7	8.8	11.3
182				67.7	2.2	3.4				77.4	9.7	14.3			
183	75.0						78.5	3.5	4.7				87.0	8.5	10.8
184				74.5	6.0	8.8				83.1	8.6	11.5	87.5		
185	84.0	3.7	4.6				93.7	9.7	11.5				110.9	17.2	18.4
186				70.5	7.0	11.0	77.9								
187				75.0						90.0	15.0	20.0			
188				87.9	12.4	16.4									
189				79.8	5.1	6.8				85.6	5.8	7.3			
190	67.0						72.5	5.5	8.2				87.6	15.1	20.8
191				83.2	4.7	6.0				95.7	12.5	15.0			
192				88.3	5.3	6.4				101.1	12.8	14.5			
193				101.0	11.8	13.2				114.8	13.8	13.7			
194	79.8						90.2	10.4	13.0				100.9	16.7	18.5
195							82.0						90.4	8.4	10.2
196				104.5	8.8	9.2				113.0	9.5	8.1			
197				83.0	7.5	9.0	84.3						98.5	14.2	16.8
198				97.1	13.4	16.0				110.7	13.6	14.0			
199				106.8	17.8	20.0	121.0						130.0	9.0	7.4
200				95.3	10.3	12.1				102.4	7.1	7.5			
Av.	71.7	5.7	8.1	79.0	8.4	10.6	80.8	6.4	8.5	87.7	9.7	11.7	94.9	11.9	14.1
Av. var		1.3			3.5			2.3			3.2			3.9	

ys with consecutive measurements, from 12 to 17 years of age.

pressed in pounds.]

14½ years.			15 years.			15½ years.			16 years.			16½ years.			17 years.			No.
Weight.	Increment, 13½–14½ years.	Per cent gain.	Weight.	Increment, 14–15 years.	Per cent gain.	Weight.	Increment, 14½–15½ years.	Per cent gain.	Weight.	Increment, 15–16 years.	Per cent gain.	Weight.	Increment, 15½–16½ years.	Per cent gain.	Weight.	Increment, 16–17 years.	Per cent gain.	
96.5	9.0	10.3	105.5	....	....	115.2	18.7	19.5	....	....	....	124.5	9.3	8.1	....	....	....	151.
90.5	13.3	17.2	....	....	....	....	....	....	....	....	....	....	....	....	180.9	....	....	152.
76.0	8.9	13.1	79.5	....	....	91.0	15.0	19.7	96.0	16.5	20.8	102.0	11.0	12.1	110.0	14.0	14.6	153.
....	....	....	96.4	12.1	14.4	....	....	....	111.3	14.9	15.5	....	....	....	128.5	17.2	15.5	154.
....	....	....	102.1	9.9	10.7	....	....	....	115.5	13.4	13.1	....	....	....	117.7	2.2	1.9	155.
76.0	....	....	....	....	....	84.7	8.7	11.4	90.0	....	....	101.5	16.8	19.8	112.5	22.5	25.0	156.
....	....	....	112.5	....	....	118.0	....	....	131.7	19.2	17.1	....	....	....	135.5	3.8	2.9	157.
....	....	....	76.1	4.5	6.3	....	....	....	90.9	14.8	19.4	....	....	....	103.4	12.5	13.8	158.
91.5	4.9	5.6	....	....	....	100.5	9.0	9.8	....	....	....	....	....	....	....	....	....	159.
80.0	....	....	....	....	....	....	....	....	101.8	....	....	....	....	....	106.5	4.7	4.6	160.
89.1	7.3	8.9	....	....	....	94.6	5.5	6.2	....	....	....	109.8	15.2	16.1	....	....	....	161.
87.7	21.2	27.7	104.3	....	....	112.8	25.1	28.6	122.5	18.2	17.4	128.0	15.2	12.4	135.0	12.5	10.2	162.
....	....	....	98.3	14.9	17.9	....	....	....	112.6	14.3	14.5	....	....	....	121.7	9.1	8.2	163.
....	....	....	105.5	8.0	8.2	....	....	....	127.6	22.1	20.9	....	....	....	134.2	6.6	5.2	164.
102.7	14.7	16.8	....	....	....	118.8	16.1	15.7	....	....	....	129.8	11.0	9.3	....	....	....	165.
110.7	15.0	15.7	....	....	....	115.2	4.5	4.1	....	....	....	....	....	....	122.1	....	....	166.
....	....	....	103.8	16.2	18.5	....	....	....	113.3	9.5	9.2	....	....	....	123.6	10.3	9.1	167.
93.5	13.6	17.0	....	....	....	106.3	12.8	13.7	....	....	....	115.7	9.4	8.8	....	....	....	168.
108.8	....	....	....	....	....	....	....	....	125.5	....	....	126.5	....	....	....	....	....	169.
....	....	....	99.2	7.4	8.1	....	....	....	95.0	−4.2	−4.2	....	....	....	130.2	35.2	37.1	170.
....	....	....	105.8	−1.2	−1.1	....	....	....	114.4	8.6	8.1	....	....	....	122.9	8.5	7.4	171.
95.3	13.0	15.8	....	....	....	117.0	21.7	22.8	....	....	....	141.7	24.7	21.1	....	....	....	172.
....	....	....	120.6	12.6	11.6	....	....	....	....	....	....	....	....	....	....	....	....	173.
82.9	7.7	10.2	....	....	....	104.5	21.6	26.1	....	....	....	117.0	12.5	12.0	....	....	....	174.
103.0	14.9	16.8	....	....	....	111.5	7.9	7.6	....	....	....	120.3	8.8	7.9	....	....	....	175.
....	12.0	14.6	....	9.4	10.5	....	13.9	15.4	....	13.4	13.8	....	3.4	12.7	....	12.2	11.9	Av.
....	3.7	....	....	4.3	....	....	5.8	....	....	4.8	....	....	3.7	....	....	5.5	....	Av. var.
93.2	....	....	105.2	23.2	28.3	117.5	24.3	26.1	120.4	15.2	14.4	....	....	....	127.5	7.1	5.9	176.
....	....	....	108.0	14.3	15.3	118.0	....	....	....	....	....	....	....	....	138.5	....	....	177.
88.0	....	....	....	....	....	....	....	....	102.9	....	....	119.4	....	....	....	....	....	178.
....	....	....	123.9	20.3	19.6	....	....	....	136.6	12.7	10.3	....	....	....	140.1	3.5	2.6	179.
80.5	10.7	15.3	....	....	....	97.9	17.4	21.6	....	....	....	111.5	13.6	13.9	....	....	....	180.
....	....	....	103.0	16.3	18.8	....	....	....	121.2	18.2	17.8	....	....	....	130.9	9.7	8.0	181.
....	....	....	....	....	....	....	....	....	....	....	....	110.8	....	....	....	....	....	182.
....	....	....	92.5	5.5	6.3	....	....	....	108.7	16.2	17.5	....	....	....	118.1	9.4	8.6	183.
92.5	9.4	11.3	104.2	16.7	19.1	100.7	17.2	18.9	....	....	....	122.8	13.1	11.9	128.5	....	....	184.
....	....	....	123.4	18.5	16.7	....	....	....	143.0	13.6	10.5	....	....	....	146.0	3.0	2.1	185.
92.9	....	....	97.9	....	....	....	....	....	113.9	16.0	16.3	....	....	....	130.5	16.6	14.6	186.
107.0	17.0	18.9	110.6	....	....	....	....	....	....	....	....	133.8	....	....	134.6	....	....	187.
118.1	....	....	....	....	....	130.5	12.4	10.5	....	....	....	138.8	8.3	6.4	....	....	....	188.
94.4	8.8	10.3	....	....	....	117.5	23.1	24.5	....	....	....	128.4	10.9	9.3	....	....	....	189.
....	....	....	102.8	15.2	17.4	....	....	....	109.4	6.6	6.4	....	....	....	109.8	.4	.4	190.
108.0	12.3	12.9	....	....	....	132.0	24.0	22.2	....	....	....	139.7	7.7	5.8	....	....	....	191.
112.9	11.8	11.7	....	....	....	130.5	17.6	15.6	....	....	....	141.9	11.4	8.7	....	....	....	192.
123.5	8.7	7.6	....	....	....	137.9	14.4	11.7	....	....	....	155.7	17.8	12.9	....	....	....	193.
....	....	....	124.3	17.4	16.3	....	....	....	146.9	22.6	18.2	....	....	....	152.0	5.1	3.5	194.
98.4	....	....	....	....	....	100.5	2.1	2.1	....	....	....	98.5	−2.0	−2.0	....	....	....	195.
128.7	15.7	13.9	....	....	....	133.1	4.4	3.4	....	....	....	153.5	20.4	15.4	....	....	....	196.
....	....	....	110.6	12.1	12.3	....	....	....	118.8	8.2	7.4	....	....	....	....	....	....	197.
123.2	12.5	11.3	....	....	....	124.3	1.1	.9	....	....	....	128.7	4.4	3.6	....	....	....	198.
....	....	....	....	....	....	156.2	....	....	....	....	....	158.6	2.4	1.6	....	....	....	199.
111.2	8.8	8.6	....	....	....	132.9	21.7	19.5	....	....	....	146.7	13.8	10.4	....	....	....	200.
98.5	11.6	10.1	104.9	16.0	17.0	115.4	15.0	14.8	115.4	14.3	13.2	127.1	10.2	8.2	128.5	7.9	5.7	Av.
....	2.3	....	....	3.3	....	....	6.7	....	....	3.6	....	....	5.0	....	....	3.9	....	Av. var.

TABLE 19.—*Increments of growth in lung capacity for a group*

[Lung capacity and increment

No.	7 years.			7½ years.			8 years.			8½ years.			9 years.			9½ years.		
	Lung capacity.	Increment, 6-7 years.	Per cent gain.	Lung capacity.	Increment, 6½-7½ years.	Per cent gain.	Lung capacity.	Increment, 7-8 years.	Per cent gain.	Lung capacity.	Increment, 7½-8½ years.	Per cent gain.	Lung capacity.	Increment, 8-9 years.	Per cent gain.	Lung capacity.	Increment, 8½-9½ years.	Per cent gain.
1	65															80		
2	61						73	12	20.0				84	11	15.1			
3	60						62	2	3.4				76	14	22.5			
4										68			78					
5				50									70			88		
6										65			68			68	3	4.6
7				55						79	24	43.6				92	13	16.4
8				61						61	0	.0				78	17	27.9
9				76						98	22	28.9				98	0	.0
10	70	50	250.0				78	8	11.4				84	6	7.7			
11				68	18	36.0				88	20	29.1				96	8	9.1
12	52			62						70	8	12.9				70	0	.0
13										80			80			95	15	18.8
14	38																	
15										70			70			80	10	14.3
16	70						70	0	.0				70	0	.0			
17	60						78	18	30.0				84	6	7.7			
18				50	10	25.0				70	20	40.0				78	8	11.4
19	65			85														
20	40									66						72	6	9.1
21										98						95	−3	−3.1
22				74			80						90	10	12.5			
23				102						102	0	.0				116	14	1.4
24				86			92						90	−2	−2.2			
25	90	26	40.6				96	6	6.7				104	8	8.3			
Av		38	145.3		14	30.5		7.7	8.9		3	20.6		6.8	9.2		7.9	9.1
Av. var		12			4			5.0			8			2.3			5.3	
26	40						60	20	50.0				90	30	50.0			
27				72			79			79	6	8.2	85	6	7.6	75	−4	−5.1
28	75			75			80	5	6.6									
29				72						72	0	.0				92	20	2.8
30	59						80	21	35.6				88	8	10.0			
31				98	14	16.7				100	2	2.0				112	12	12.0
32	40																	
33				68	7	11.5				78	10	14.7				89	11	14.1
34										95						105	10	10.5
35				80									104					
36																68		
37				80			90						110	20	22.2			
38	66			80	14	21.2				90	10	12.5				100	10	11.1
39				80						86	6	7.5				104	18	20.9
40	100						108	8	8.0				107	−1	−.9			
41	110			115			85	−25	−21.7	100	−15	−13.0	100	15	17.6			
42				90						100	10	11.1				104	4	4.0
43	60			85			70	10	16.6									
44				70									85					
45				61	37	154.1				86	25	40.8				110	24	27.8
46				108	38	54.3				96	−12	−11.1				120	24	25.0
47				74						86	12	16.2				90	4	4.6
48										90			100			100	10	11.1
49	78						80	2	2.5				88	8	10.0			
50	98			104	6	6.2	108	10	12.0	90	−14	−13.4						
Av	71.3			77.9	19.3	44.2	81.8	6.4	13.6	83.5	3.3	6.3	87.3	12.3	16.6	91.7	11.9	11.6
Av. var					12.1			9.2			9.5			8.0			8.2	

0 girls with consecutive measurements, from 7 to 13 years of age.

essed in cubic inches.]

0 years.			10½ years.			11 years.			11½ years.			12 years.			12½ years.			13 years.			
ung	Increment, 9-10 years.	Per cent gain.	Lung capacity.	Increment, 9½-10½ years.	Per cent gain.	Lung capacity.	Increment, 10-11 years.	Per cent gain.	Lung capacity.	Increment, 10½-11½ years.	Per cent gain.	Lung capacity.	Increment, 11-12 years.	Per cent gain.	Lung capacity.	Increment, 11½-12½ years.	Per cent gain.	Lung capacity.	Increment, 12-13 years.	Per cent gain.	No.
85			75	−5	−6.3				85	10	13.3	97			105	20	23.5	120	23	23.7	1.
98	14	16.7				108	10	10.2				118	10	9.3				148	30	25.4	2.
94	18	23.6				102	8	8.5				110	8	7.8				124	14	12.7	3.
72	−6	−7.7				92	20	28.5				100	8	8.7				114	14	14.0	4.
			92	4	4.5				98	6	6.5	90			112	14	14.2	104			5.
			79	11	16.2																6.
			88	4	4.4				98	10	11.3										7.
			92	14	17.9				114	22	23.9				126	12	10.5				8.
			118	20	20.1				124	6	5.1				134	10	8.1				9.
88	4	4.8				110	22	25.0				112	2	1.8				134	22	19.7	10.
			98	2	2.0				108	10	10.2				118	10	.9				11.
									94												12.
			100	5	5.6	105			115	10	9.5	130	25	23.8	140	25	21.7	155	25	19.2	13.
90						113						180	67	59.2				125	−55	−30.5	14.
80	10	14.3				85	5	6.3	95			95	10	11.7	125	30	31.5	130	35	36.8	15.
98	28	40.0				92	−6	−6.1				118	26	28.2				138	20	16.9	16.
84	0	.0				102	18	21.4				122	20	19.6							17.
			88	10	12.8				96	8	9.1				120	24	25.0				18.
105			125			125	20	19.0				130	5	4.0	165			180	50	38.4	19.
			80	8	11.1	76						112	36	47.3				122	10	8.9	20.
105			130	35	36.8	132	27	25.7	130	0	.0	145	13	9.8	155	25	19.2	165	20	13.8	21.
94	4	4.4				110	16	17.0				118	8	7.2				138	20	16.9	22.
124						134	10	8.1				158	24	17.9				188	30	19.0	23.
108	18	20.0				110	2	1.9				128	18	16.3				140	12	4.3	24.
114	10	9.6				124	10	8.8	126			136	12	9.6				158	22	16.1	25.
	10.0	12.6		9.8	11.4		12.5	13.4		9.1	9.9		18.2	17.6		18.9	17.2		18.3	16.0	Av.
	6.6			7.3			7.4			2.7			11.1			6.6			11.4		Av. var.
108	18	20.0				114	6	5.5				128	14	12.2				148	20	15.4	26.
															114						27.
100			110			120	20	20.0				145	25	20.8	165			165	20	13.7	28.
91						110	13	20.8				122	12	10.9				161	39	31.9	29.
98	10	11.3				104	6	6.1				118	14	13.4	130						30.
			114	2	1.7				126	12	10.5				142	16	12.7				31.
			90			84						122	38	45.2	128						32.
			98	9	10.1				110	12	12.2				136	26	23.6				33.
			130	25	23.8				130	0	.0				145	15	11.5				34.
14	10	9.6				120	6	5.2				132	12	10.0				144	12	9.1	35.
96			128	60	88.2	159	63	65.6							147			147			36.
22	12	1.1				130	8	6.5				144	14	10.7				168	24	14.2	37.
			120	20	20.0				132	12	10.0				178	46	34.8				38.
			120	16	15.3										138						39.
24	17	15.8				132	8	6.4				140	8	6.1				160	20	14.4	40.
						130			140			155	25	19.2				175	20	12.9	41.
			118	14	13.4				118	0	.0				142	24	20.3				42.
			115			130						140	10	7.7	140						43.
2	37	43.5				134	12	9.8	153			153	19	14.1	165	12	7.8				44.
			120	10	9.1				128	8	6.6				150	22	17.1				45.
			130	10	8.3				142	12	9.2				190	48	33.8				46.
			112	22	24.4				124	12	10.7				164	40	32.3				47.
			105	5	5.0	110			125	20	19.1	130	20	18.1				150	10	7.1	48.
0	22	25.0				124	14	12.7				140	16	12.8							49.
									122												50.
9	18.0	18.0	106.7	17.6	19.9	114	16.2	15.8	119	9.8	8.7	128	17.5	15.5	141.3	27.7	21.8	146.2	19.4	14.8	Av.
	6.6			10.1			10.7			2.6			6.1			11.4			5.5		Av. var.

TABLE 20.—*Increments of growth in lung capacity for a group*

[Lung capacity and increment

No.	12 years.			12½ years.			13 years.			13½ years.			14 years.		
	Lung capacity.	Increment, 11–12 years.	Per cent gain.	Lung capacity.	Increment, 11½–12½ years.	Per cent gain.	Lung capacity.	Increment, 12–13 years.	Per cent gain.	Lung capacity.	Increment, 12½–13½ years.	Per cent gain.	Lung capacity.	Increment, 13–14 years.	Per cent gain.
51	90			106						126	20	18.9			
52	98	4	14.3				118	20	20.4				130	12	10.2
53				128						128	0	.0			
54				100	2	2.0	110						130	20	18.2
55				86	4	4.9	90						105	15	16.7
56	110	30	37.5	116						124	8	6.9			
57	100	−25	−20.0	105	−25	−19.2	110	10	10.0						
58				90	2	2.3				118	28	31.1			
59	120	28	30.4				140	20	16.7				144	4	2.9
60	110	14	14.6				124	14	12.7	138					
61	122	12	10.9				142	20	16.4				154	12	8.5
62	125			120	15	14.3				145	25	20.8	170		
63	105												142		
64	105												150		
65				110	6	5.8	124						144	20	16.1
66	125	25	25.0				150	25	20.0	175			185	35	23.3
67										145			140		
68	118	10	19.3	128						144	16	12.5			
69	112									136					
70				130	16	14.0				148	18	13.8			
71	146						158	12	8.2				170	12	7.6
72	112	14	14.3				128	16	14.3				136	8	6.3
73	119	29	32.3										148		
74				132	22	20.0				138	6	4.5			
75	124	24	24.0				142	18	14.5				142	0	.0
Av.		15.0	16.6		5.3	5.5		17.2	14.8		15.1	13.6		13.8	11.0
Av. var.		11.0			9.5			3.9			5.9			5.5	
76	110						120	10	9.1				140	20	16.7
77	112	12	12.0				125	13	11.6				135	10	8.0
78	110	10	10.0				125	15	13.6	140					
79				130	22	20.4				150	20	15.4			
80															
81	124						140	16	12.9				150	10	7.1
82	105	5	5.0										140		
83	112	10	9.8				140	28	22.3	144			168	28	20.0
84	128						136	8	6.3				148	12	8.8
85							61						70	9	14.8
86	140	12	9.4				154	14	10.0				190	36	23.3
87				136	18	15.3	154						180	26	16.9
88													115		
89	145						150	5	3.4						
90				136	24	21.4				160	24	17.6			
91				150											
92	138	19	16.0				170	32	23.2				174	4	2.4
93	171			183			171	0	.0	177	−6	−3.3	165	−6	−3.5
94				134	28	26.4				148	14	10.4	156		
95	124	4	3.3				140	16	12.9				176	36	25.7
96	130	5	4.0										170		
97	146						164	18	13.3				190	26	15.8
98				180	20	12.5				210	30	16.7			
99				168	30	21.7				170	2	1.2			
100				138	18	15.0				138	0	.0			
Av.	125.2	9.6	8.7	128.9	22.9	19.0	134.1	14.6	11.5	147.7	12.0	8.3	153.5	17.6	13.0
Av. var.		3.7			3.9			5.0			9.7			11.1	

of 50 girls with consecutive measurements, from 12 to 17 years of age.

expressed in cubic inches.]

14½ years.			15 years.			15½ years.			16 years.			16½ years.			17 years.			No.
Lung capacity.	Increment, 13½–14½ years.	Per cent gain.	Lung capacity.	Increment, 14½–15 years.	Per cent gain.	Lung capacity.	Increment, 14½–15½ years.	Per cent gain.	Lung capacity.	Increment, 15–16 years.	Per cent gain.	Lung capacity.	Increment, 15½–16½ years.	Per cent gain.	Lung capacity.	Increment, 16–17 years.	Per cent gain.	
152	26	20.6	.....	.....	.....	152	0	0.0	160	.....	.....	164	12	7.9	.....	.....	.....	51.
.....	.....	.....	152	22	16.9	.....	.....	.....	152	0	0.0	.....	.....	.....	156	4	2.6	52.
160	32	25.0	.....	.....	.....	172	12	7.5	.....	.....	.....	.....	.....	.....	220	.....	.....	53.
.....	.....	.....	140	10	7.7	.....	.....	.....	144	4	2.9	.....	.....	.....	154	10	6.9	54.
.....	.....	.....	124	19	18.1	.....	.....	.....	140	16	12.9	.....	.....	.....	150	10	7.1	55.
148	24	19.4	.....	.....	.....	168	20	13.5	.....	.....	.....	180	12	7.1	.....	.....	.....	56.
.....	.....	.....	145	.....	.....	140	.....	.....	160	15	10.3	.....	.....	.....	170	10	6.3	57.
134	16	13.6	.....	.....	.....	140	6	4.5	.....	.....	.....	140	0	.0	.....	.....	.....	58.
.....	.....	.....	152	8	5.6	.....	.....	.....	156	4	2.6	.....	.....	.....	164	8	5.1	59.
148	10	7.2	.....	.....	.....	158	10	6.8	.....	.....	.....	158	0	.0	.....	.....	.....	60.
.....	.....	.....	168	14	9.1	.....	.....	.....	178	10	6.0	.....	.....	.....	.....	.....	.....	61.
.....	.....	.....	185	15	8.8	195	.....	.....	.....	.....	.....	205	10	5.1	200	.....	.....	62.
155	.....	.....	160	18	12.7	.....	.....	.....	165	5	3.1	175	.....	.....	.....	.....	.....	63.
150	.....	.....	155	5	3.3	.....	.....	.....	160	5	3.2	160	.....	.....	170	10	6.3	64.
.....	.....	.....	158	14	9.7	.....	.....	.....	172	14	8.9	.....	.....	.....	172	0	.0	65.
190	15	8.6	215	30	16.2	215	25	13.2	210	−5	−2.3	215	0	.0	195	−15	−7.1	66.
.....	.....	.....	.....	.....	.....	140	.....	.....	.....	.....	.....	147	7	5.0	.....	.....	.....	67.
168	24	16.7	.....	.....	.....	182	14	8.3	.....	.....	.....	192	10	5.5	.....	.....	.....	68.
148	12	8.8	180	.....	.....	.....	.....	.....	190	10	5.6	.....	.....	.....	196	6	3.2	69.
164	16	10.8	.....	.....	.....	164	0	.0	.....	.....	.....	172	8	4.9	.....	.....	.....	70.
.....	.....	.....	190	20	11.8	.....	.....	.....	192	2	1.1	.....	.....	.....	178	−14	−7.3	71.
.....	.....	.....	148	12	8.8	.....	.....	.....	150	2	1.3	.....	.....	.....	160	10	6.7	72.
.....	.....	.....	158	10	6.8	.....	.....	.....	162	4	2.5	.....	.....	.....	164	2	1.2	73.
148	10	7.2	.....	.....	.....	148	0	.0	.....	.....	.....	148	0	.0	.....	.....	.....	74.
.....	.....	.....	168	26	18.3	.....	.....	.....	168	0	.0	.....	.....	.....	170	2	1.2	75.
.....	18.5	13.8	.....	15.9	10.9	.....	9.7	6.0	.....	5.0	3.9	.....	5.9	3.6	.....	3.3	2.5	Av.
.....	6.4	.....	.....	5.6	.....	.....	4.0	.....	.....	3.9	.....	.....	2.3	.....	.....	6.4	.....	Av. var
.....	.....	.....	160	20	14.3	.....	.....	.....	166	6	3.8	.....	.....	.....	178	12	7.2	76.
.....	.....	.....	154	19	14.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	166	.....	.....	77.
160	20	14.3	165	.....	.....	155	−5	−3.1	170	5	3.0	175	20	13.9	.....	.....	.....	78.
168	18	12.0	.....	.....	.....	180	12	7.1	.....	.....	.....	184	4	2.2	.....	.....	.....	79.
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	80.
.....	.....	.....	150	0	.0	180	.....	.....	184	34	22.7	.....	.....	.....	188	4	2.2	81.
150	.....	.....	145	5	3.6	.....	.....	.....	150	5	3.3	170	.....	.....	170	20	13.3	82.
.....	.....	.....	177	9	5.4	.....	.....	.....	198	21	11.9	.....	.....	.....	204	6	3.0	83.
.....	.....	.....	170	22	14.9	.....	.....	.....	172	2	1.2	.....	.....	.....	178	6	3.5	84.
81	.....	.....	85	14	20.0	.....	.....	.....	.....	.....	.....	158	.....	.....	.....	.....	.....	85.
.....	.....	.....	190	0	.0	.....	.....	.....	234	44	23.2	.....	.....	.....	236	2	.9	86.
.....	.....	.....	194	14	7.8	.....	.....	.....	208	14	7.2	.....	.....	.....	216	8	3.8	87.
115	.....	.....	130	15	13.0	121	6	5.1	.....	.....	.....	147	26	21.5	166	.....	.....	88.
155	.....	.....	175	.....	.....	.....	.....	.....	190	15	8.6	.....	.....	.....	180	−10	−5.3	89.
174	14	8.8	.....	.....	.....	184	10	5.7	.....	.....	.....	186	2	1.1	.....	.....	.....	90.
190	.....	.....	200	.....	.....	210	20	10.5	.....	.....	.....	200	−10	−4.8	215	.....	.....	91.
190	.....	.....	.....	.....	.....	.....	.....	.....	204	.....	.....	206	.....	.....	.....	.....	.....	92.
.....	.....	.....	.....	.....	.....	.....	.....	.....	192	.....	.....	184	.....	.....	.....	.....	.....	93.
.....	.....	.....	170	14	9.0	.....	.....	.....	.....	.....	.....	172	.....	.....	180	.....	.....	94.
.....	.....	.....	190	14	8.0	196	.....	.....	.....	.....	.....	200	4	2.0	.....	.....	.....	95.
165	.....	.....	175	5	2.9	170	5	3.0	180	5	2.9	185	15	8.8	190	10	5.6	96.
.....	.....	.....	200	10	5.3	.....	.....	.....	212	12	6.0	.....	.....	.....	220	8	3.8	97.
226	16	7.6	.....	.....	.....	240	14	6.2	.....	.....	.....	238	−2	−.8	.....	.....	.....	98.
180	10	5.5	.....	.....	.....	194	14	1.8	.....	.....	.....	196	2	1.0	.....	.....	.....	99.
150	12	8.7	.....	.....	.....	164	14	9.3	.....	.....	.....	170	6	3.7	.....	.....	.....	100.
158.8	15.0	9.5	164.5	11.5	8.5	172.6	10.0	5.0	176.5	14.8	8.5	178.8	6.7	5.0	183	6.6	3.8	Av.
.....	3.0	.....	.....	4.1	.....	.....	5.3	.....	.....	9.9	.....	.....	8.2	.....	.....	5.0	.....	Av. var.

TABLE 21.—*Increments of growth in lung capacity for a group of*

[Lung capacity and increment

No.	7 years.			7½ years.			8 years.			8½ years.			9 years.			9½ years.			10 years.		
	Lung capacity.	Increment, 6-7 years.	Per cent gain.	Lung capacity.	Increment, 6½-7½ years.	Per cent gain.	Lung capacity.	Increment, 7-8 years.	Per cent gain.	Lung capacity.	Increment, 7½-8½ years.	Per cent gain.	Lung capacity.	Increment, 8-9 years.	Per cent gain.	Lung capacity.	Increment, 8½-9½ years.	Per cent gain.	Lung capacity.	Increment, 9-10 years.	Per cent gain.
101.	55												80			92			96	−4	−5.0
102.										70						86	16	22.9			
103.	58						60	2	3.4				60	0	0.0				64	4	6.7
104.				72	8	12.5				82	10	13.9				90	8	9.8			
105.				67						91	24	35.8				100	9	9.9			
106.	60						68	8	1.3				68	0	.0						
107.				55						72	17	30.9				80	8	11.1			
108.													76					8.3	90	14	18.4
109.										96						104	8				
110.							70						84	14	20.0				98	14	16.7
111.				66			68						82	14	20.6				100	18	21.9
112.	76	12	18.8				80	4	5.3				92	12	15.0				100	8	8.7
113.	70						70	0	.0				102	32	45.7	112					
114.	76	16	27.7				90	14	18.4				96	0	.0				96	6	6.7
115.				88	18	25.0				96	8	9.1				102	6	6.3			
116.							76						98	22	28.9				118	20	20.4
117.	65						65	0	.0										102		
118.				74	4	5.7				90	16	21.6				102	12	13.3	92		
119.				66						84	18	27.3				104	20	23.8			
120.				66	16	32.0				70	4	6.1				72	2	2.9			
121.				82						84	2	2.4				92	8	9.5			
122.										86						100	14	16.2			
123.				72						80	8	11.1				90	10	12.5			
124.										75			85			80	5	6.6			
125.							74						90	16	21.6				108	18	20.0
Av.		14	23.3		11.5	19.0		4.7	9.5		11.9	17.6		12.2	16.9		9.7	11.8		10.9	12.7
Av. var.		2			5.5			2.7			6.1			6.8			8.0			7.1	
126.							78						92	14	18.2				100	8	8.7
127.	60						78	18	30.0				90	12	15.4				110	20	22.2
128.	90						100	10	11.1				122	22	22.0				130	8	6.6
129.				108						92	−16	−14.8				122	30	32.6			
130.	65			75															110		
131.										98						128	30	30.6			
132.													108			120					
133.							92						90	−2	−2.2	136					
134.				130			132														
135.				61						112	51	83.6				120	8	7.1			
136.				80			100						118	18	18.0				124	6	5.1
137.				98									108			132					
138.	79						100	21	26.7				110	10	10.0				114	4	3.6
139.																93					
140.				92						106	14	15.2				106	0	.0			
141.										92						96	4	4.3			
142.										110											
143.	84			100						112	12	12.0							132	8	
144.										106						110	4	3.8			
145.				102						112	10	9.8				126	14	12.5			
146.	86						120	34	40.0				140	20	16.7	142			148	8	5.7
147.	96						106	10	10.4				120	14	13.2				132	12	10.0
148.	85			100															135		
149.										114						128	14	12.3			
150.	130	30	30.0																154		
Av.	77.2			82.4			85.6	18.6	25.6	92.6	14.2	21.1	95.7	13.5	13.9	105.9	13.0	12.9	111.5	9.4	8.8
Av. var.								7.1			14.7			5.1			7.4			3.7	

50 boys, with consecutive measurements, from 7 to 13 years of age.

expressed in cubic inches.]

10½ years.			11 years.			11½ years.			12 years.			12½ years.			13 years.			No.
Lung capacity.	Increment, 9½–10½ years.	Per cent gain.	Lung capacity.	Increment, 10–11 years.	Per cent gain.	Lung capacity.	Increment, 10½–11½ years.	Per cent gain.	Lung capacity.	Increment, 11–12 years.	Per cent gain.	Lung capacity.	Increment, 11½–12½ years.	Per cent gain.	Lung capacity.	Increment, 12–13 years.	Per cent gain.	
....	....	....	....	....	....	81	....	....	95	....	....	100	19	23.5	100	5	5.3	101.
94	8	9.3	....	....	....	98	4	4.3	....	....	....	110	12	12.2	....	....	....	102.
....	....	....	72	8	12.5	....	....	....	80	8	11.1	....	....	....	....	....	....	103.
102	12	13.3	....	....	....	106	4	3.9	....	....	....	118	12	11.3	....	....	....	104.
120	20	20.0	....	....	....	128	8	6.7	....	....	....	136	8	6.3	....	....	....	105.
....	....	....	70	....	....	....	....	....	88	18	25.7	....	....	....	100	12	13.6	106.
88	8	10.0	....	....	....	90	2	2.3	....	....	....	....	....	....	....	....	....	107.
....	....	....	88	−2	−2.2	....	....	....	90	2	2.3	....	....	....	114	24	26.7	108.
....	....	....	....	....	....	105	....	....	130	....	....	130	25	23.8	138	8	6.2	109.
....	....	....	108	10	10.2	....	....	....	110	8	7.4	....	....	....	128	12	10.4	110.
....	....	....	118	18	18.0	....	....	....	120	2	1.7	....	....	....	122	2	1.7	111.
....	....	....	110	10	10.0	....	....	....	114	4	3.6	....	....	....	130	16	14.0	112.*
122	10	8.9	....	....	....	136	14	11.4	....	....	....	150	14	10.3	....	....	....	113.
....	....	....	104	8	8.3	....	....	....	....	....	....	120	....	14.5	....	....	....	114.
120	18	17.6	....	....	....	124	4	3.3	....	....	....	142	18	....	....	....	....	115.
....	....	....	124	6	5.1	....	....	....	126	2	1.6	....	....	....	154	28	22.2	116.
....	....	....	107	5	4.9	104	....	....	....	....	....	110	6	5.8	....	....	....	117.
....	....	....	104	12	13.4	....	....	....	118	14	13.5	....	....	....	122	4	3.4	118.
110	6	5.8	....	....	....	120	10	9.1	....	....	....	....	....	....	....	....	....	119.
80	8	11.1	....	....	....	100	20	25.0	....	....	....	....	....	....	....	....	....	120.
100	8	8.7	....	....	....	110	10	10.0	....	....	....	110	0	....	....	....	....	121.
104	4	4.0	....	....	....	110	6	5.8	....	....	....	136	26	23.6	....	....	....	122.
98	−8	8.8	....	....	....	122	24	24.5	....	....	....	128	6	4.9	....	....	....	123.
95	15	18.8	111	....	....	....	....	....	100	−11	−10.0	....	....	....	135	35	35.0	124.
....	....	....	108	0	.0	....	....	....	120	18	15.7	....	....	....	132	6	4.8	125.
....	9.0	14.4	....	7.5	8.0	....	9.6	9.7	....	6.5	7.3	....	13.3	12.4	....	13.8	13.0	Av.
....	4.9	....	....	3.5	....	....	5.4	....	....	6.7	....	....	6.5	....	....	8.7	....	Av. var.
....	....	....	112	12	12.0	138	....	....	....	....	....	148	10	7.2	....	....	....	126.
....	....	....	128	18	16.4	....	....	....	144	16	12.5	....	....	....	144	0	.0	127.
....	....	....	138	8	6.2	....	....	....	184	46	33.3	....	....	....	230	46	25.0	128.
140	18	14.8	....	....	....	148	8	5.7	....	....	....	152	4	2.7	....	....	....	129.
120	....	....	115	5	4.5	....	....	....	137	22	19.1	150	....	....	....	....	....	130.
140	12	9.4	156	....	....	....	....	....	178	22	14.1	....	....	....	192	14	7.9	131.
124	4	3.5	....	....	....	140	16	12.9	....	....	....	154	14	10.0	....	....	....	132.
143	6	4.4	....	....	....	152	10	7.1	....	....	....	172	20	13.2	....	....	....	133.
....	....	....	....	....	....	128	....	....	148	....	....	150	22	17.2	....	....	....	134.
126	6	5.0	....	....	....	130	4	3.2	....	....	....	....	....	....	....	....	....	135.
....	....	....	138	14	11.1	....	....	....	156	18	13.0	....	....	....	....	....	....	136.
140	8	6.1	....	....	....	156	16	11.4	....	....	....	172	16	10.2	....	....	....	137.
....	....	....	128	14	12.2	....	....	....	142	14	10.9	....	....	....	....	....	....	138.
....	....	....	75	....	....	....	....	....	100	25	33.0	125	....	....	145	45	45.0	139.
132	26	24.5	....	....	....	158	26	20.0	....	....	....	....	....	....	....	....	....	140.
110	14	14.4	....	....	....	108	−2	−1.8	....	....	....	118	10	9.3	....	....	....	141.
135	....	....	140	....	....	155	20	14.8	170	30	21.4	175	20	12.9	190	20	11.7	142.
144	....	....	....	....	....	152	8	5.6	....	....	....	152	0	.0	....	....	....	143.
130	20	18.2	....	....	....	132	2	1.5	....	....	....	146	14	10.6	....	....	....	144.
140	14	11.1	....	....	....	156	16	11.4	....	....	....	174	18	11.5	....	....	....	145.
160	18	12.6	178	30	20.3	....	....	....	188	10	5.6	....	....	....	198	10	5.3	146.
....	....	....	152	20	15.2	....	....	....	166	14	9.2	....	....	....	182	16	9.6	147.
150	....	....	137	2	1.5	....	....	....	145	8	5.6	165	....	....	....	....	....	148.
134	6	4.7	....	....	....	146	12	9.0	....	....	....	150	4	2.7	....	....	....	149.
172	....	....	174	20	12.9	....	....	....	190	16	9.2	....	....	....	210	20	10.6	150.
123.2	12.7	10.7	115.8	14.3	11.2	126.2	11.3	8.4	134.0	20	15.6	140.5	12.7	9.0	150.8	21.4	14.4	Av.
....	5.7	....	....	6.2	....	....	6.3	....	....	7.4	....	....	5.0	....	....	9.4	....	Av. var.

TABLE 22.—*Increments of growth in lung capacity of a group of*

[Lung capacity and increment

No.	12 years.			12½ years.			13 years.			13½ years.			14 years.		
	Lung capacity.	Increment, 11–12 years.	Per cent gain.	Lung capacity.	Increment, 11½–12½ years.	Per cent gain.	Lung capacity.	Increment, 12–13 years.	Per cent gain.	Lung capacity.	Increment, 12½–13½ years.	Per cent gain.	Lung capacity.	Increment, 13–14 years.	Per cent gain.
151	110			110						150	40	36.3			
152	108						124	16	14.8	124					
153				125			130			130	5	4.0			
154	103						120	17	16.5				132	12	10.0
155	90	−2	−2.2				118	28	31.1				148	30	25.4
156													100		
157							130								
158							118						118	0	.0
159	130						138	8	6.2	145					
160	100						108	8	8.0				118	10	9.3
161				118						142	24	20.3			
162										138					
163	124	14	12.7				120	2	1.6				168	42	33.3
164	135						152	17	12.6				172	20	13.2
165				128	12	10.3				148	20	15.6			
166	100						128	28	28.0	152					
167				118	2	17.2				142	24	20.3	104		
168	162	0	.0	184						200	16	8.7			
169	110						128	18	16.4				152	24	18.8
170				132	0	.0	144						162	18	12.5
171	150	46	43.4				162	12	8.0				198	36	22.2
172				114	4	3.6									
173				132	12	10.0	155						192	37	23.9
174				102	4	4.1				112	10	9.8			
175				143	31	27.7				158	15	10.5			
Av.		14.5	13.5		9.3	10.3		15.4	14.3		19.3	15.7		22.9	16.9
Av. var.		12.0			6.4			6.3			7.8			10.9	
176	125						120	−5	−4.0						
177							108			170			150	−18	−10.7
178							118						138	20	17.0
179	124	6	5.1				128	4	3.2				152	24	18.8
180				110	8	7.8				128	18	16.4			
181	134	12	9.8				140	6	4.5				160	20	14.4
182				115	9	8.5				128	13	11.3			
183	150						172	22	14.6				180	8	4.7
184				120											
185	128						152	24	18.8				176	24	15.8
186				118	28	31.1	128								
187				140						164	24	17.1			
188				158	18	12.9									
189				138	18	15.0				142	4	2.9			
190	144	4	2.9				160	16	11.1				192	32	20.0
191				150	10	7.1				172	22	14.7			
192				176	4	2.3				188	12	6.7			
193				155	20	14.8									
194	118						142	24	20.3				178	36	25.4
195							152						178	26	17.1
196				156	11	7.6				164	8	5.1			
197				133	3	2.3	138						170	32	23.2
198				172	36	26.5				208	36	20.9			
199				162	6	3.8	190						240	50	26.3
200				150	26	19.0				158	8	5.3			
Av.	123.4	7.3	5.9	130.9	15	12.2	138.9	13.0	9.8	152.9	16.1	11.2	162.5	23.0	15.6
Av. var.		3.1			9			9.7			7.9			8.9	

50 boys with consecutive measurements, from 12 to 17 years of age.

expressed in cubic inches.]

14½ years.			15 years.			15½ years.			16 years.			16½ years.			17 years.			No.
Lung capacity.	Increment, 13–14 years.	Per cent gain.	Lung capacity.	Increment, 14–15 years.	Per cent gain.	Lung capacity.	Increment, 14½–15½ years.	Per cent gain.	Lung capacity.	Increment, 15–16 years.	Per cent gain.	Lung capacity.	Increment, 15½–16½ years.	Per cent gain.	Lung capacity.	Increment, 16–17 years.	Per cent gain.	
163	13	8.7	194			210	47	28.8				255	45	21.4				151.
142	18	14.5													230			152.
138	8	6.2	160			160	22	15.9	170	10	6.3	192	32	20.0	220	50	29.4	153.
			138	6	4.5				180	42	30.4				210	30	16.6	154.
			178	30	20.2				188	10	5.6				194	6	3.2	155.
115						142	27	23.4	140									156.
						225			248	30	13.8				270	22	8.9	157.
			140	22	18.6				140	0	.0				182	42	30.0	158.
160	15	10.3	184			184	24	15.0										159.
132									168						186	18	10.7	160.
144	2	1.4	168			168	24	16.7				180	12	7.1				161.
182	44	31.9	200			210	28	15.4	215	15	7.5	255	45	21.4	265	50	23.3	162.
			194	26	15.5				230	36	18.6				242	12	5.0	163.
			202	30	17.6				234	32	15.8				262	28	12.0	164
170	22	14.9	202			202	32	18.8				232	30	14.9				165.
184	32	21.5	211			211	27	14.7							220			166.
			182	18	11.0				218	36	19.8				230	12	5.5	167.
222	22	11.0	278			272	50	22.5				308	36	13.2				168.
172									220			240						169.
			178	16	9.9				190	12	6.7				234	44	23.2	170.
			214	16	8.1				258	44	20.6				268	10	3.9	171.
158			178			178	20	12.7			22.6	218	40	22.5				172.
			212	20	10.4				260	48	22.6							173.
152	40	35.7	180			180	28	10.8				200	20	11.1				174.
172	14	8.8	200			200	28	16.2				230	30	15.0				175.
	20.9	15.0		20.4	12.9		29.7	17.6		26.3	14.0		32.2	16.3		27.0	14.3	Av.
	10.1			5.8			6.7			14.0			8.2			13.7		Av. var.
			160	30		183			202	42	26.3				230	28	13.9	176.
			180	30	20.0	182									240			177.
138				30					182			190						178.
			218	66	43.4				254	36	16.5				268	14	5.5	179.
148	20	15.6				190	42	28.4				228	38	20.0				180.
			190	30	18.7				212	22	11.6				250	38	17.9	181.
												200						182.
			192	12	6.7				216	24	12.5				272	56	25.9	183.
165			177			190	25	15.2				220	30	15.8	148			184.
			208	32	18.2				240	32	15.4				256	16	6.7	185.
150			162						204	42	25.9				232	28	13.7	186.
212	48	29.3	218									260			256			187.
260						278	18	6.9				308	30	10.8				188.
160	18	12.7				200	40	25.0				232	32	16.0				189.
			244	52	27.1				268	24	9.8				270	2	7.5	190.
190	18	10.5				212	22	11.6				260	48	22.6				191.
238	50	26.6				278	40	16.8				320	42	15.1				192.
			220						245	25	11.4				265	20	8.2	193.
			210	32	17.9				236	26	12.4				256	20	8.5	194.
208						228	20	9.6				218	−10	−4.4				195.
178	14	8.5				210	32	18.0				254	44	21.0				196.
			196	26	15.3				212	16	8.1							197.
240	32	15.4				270	30	12.5				270	0	.0				198.
						288						310	22	7.6				199.
172	14	8.9				210	38	82.1				238	28	13.3				200.
173.8	26.8	15.8	191.7	35.0	20.9	210	30.7	16.6	212.6	28.9	15.0	242.6	27.6	12.5	236.4	24.7	12.0	Av.
	11.5			12.0			7.7			7.3			12.9			11.4		Av. var.

(B) INDIVIDUAL HEALTH NOTES.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts IIa and IIb (pp. 40, 53).[1]

Those appearing in the group of 100 in Tables 13 and 14 are: 3=136; 5=200; 6=190; 10=180; 11=115; 13=161; 14=155.

1. Excellent health; fine physique; astigmatism at 8½.

2. Pneumonia at 4; excellent health at 5. Measles, chicken pox, and whooping cough; shoulders round at last measurement. Parents American.

3. Health average at entrance and has had adenoids, bronchitis, and tonsillitis; tonsils removed; adenoids removed and arm broken at 6½; circumcised at 8 years 2 months; arm fractured at last measurement. Parents American.

4. Excellent health; has had measles, tonsillitis, chicken pox; left tonsil swollen when 13; tonsils normal when 15; eyes weak.

5. Adenoids removed at 12½; recovered from grippe at 13½; hearing in left ear defective; nervous; adenoid expression.

6. Average health; has had chicken pox, grippe, tonsillitis; anæmic at 14; tonsils slightly enlarged; gets dizzy and faint when compelled to stand still for long period of time.

7. Had double hernia at 5 years 4 months; wears truss; lordosis when 6½; eyes weak, and began to wear glasses when 9½. Mother Irish, father American.

8. At entrance has had chicken pox, whooping cough, measles, bronchitis; heart rate rather rapid; standing posture poor; out of school at — with typhoid fever; shoulders round; at 18 health good, but too fat.

9. Health good; shoulders round; recommended to see oculist. Parents American.

10. Appendix removed when 10; tonsils large and removal advised at 12 years 4 months; condition good at 13½; at 15 years 4 months was thin, anæmic, and had flat chest; eyes weak during last measurements and glasses fitted. Parents American.

11. Has had whooping cough, chicken pox; enlarged throat glands when 7½; nutrition unsatisfactory; adenitis on left side; tonsils enlarged between 9 and 10; round shoulders during last measurements. Parents American.

12. Good health during last measurements; has had pneumonia twice; adenoids removed; has lordosis.

13. Has had whooping cough, chicken pox, scarlet fever, malaria, measles; well nourished at 10 years 4 months; systolic muffled sound to heart at 17 years 8 months. Parents American.

14. Has had pneumonia, bronchitis, chicken pox, measles; uncontrolled nervous action; catarrhal tendency; shoulders, back, and spine irregular; at 10 catarrh of bowels, delicate, and ill most of the time; at 13 tendency to weak feet; at 14 glasses for near-sightedness.

15. Has had measles, chicken pox, mumps, pleurisy; health good at 13½; at 14 slight conjunctivitis; at 15 more so and at 16 full conjunctivitis; condition good at 17 years 3 months.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts IIIa and IIIb (pp. 41, 55).

Those appearing in the group of 100 in Tables 13 and 14 are: 1=146; 2=145; 5=144; 7=197; 8=186; 9=171; 10=163; 11=118; 13=103; 14=158; 15=102.

1. Had whooping cough when 7 years 11 months; corrective work begun for shape of back at 8; condition improved at 9 years 5 months; adenoids removed at 8 years 11 months; corrective gymnastic work continued.

2. Bronchial trouble and anæmic condition from second to fourth year; when 6½ had pleurisy and this continued until operation at 9 years 3 months, after which condition improved.

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[1] The health notes for Charts Ia and Ib may be found on pp. 58, 60.

3. At entrance had had chicken pox; tonsillitis at 12 years 5 months; broke wrist when 15; health good.

4. Has had bronchitis, chicken pox, measles, whooping cough; at 9 had muscular twitching of the entire body; improved at 11; much improved at 12.

5. Health good.

6. Health good at entrance. Parents American.

7. At entrance health good, but had had pneumonia; tendency to catarrh; from 10½ to 11½ well except for colds; nervous; follicular conjunctivitis; impediment in speech probably due to nasal obstruction; at 15 condition fair; flat chest.

8. At entrance health good, had had childhood diseases; tendency to biliousness (hereditary), weak stomach; at 11–12 tonsils enlarged; tendency to headache; at 13 tonsils normal; at 14½ condition good. Mother American, father Scotch.

9. At entrance health excellent, and had had measles, malaria, and scarlet fever; at 12 recovering from operation for appendicitis; out of school 4 weeks; follicular conjunctivitis; tonsils enlarged from 12–14; improved at 15; at 15 glasses for astigmatism; condition good. Mother American, father English.

10. Health good; at 18 shoulders round.

11. Has had grippe and pneumonia; entero-colitis; part nasal obstruction by adenoids and hypertrophied tonsils; tonsils removed; between 6½ and 7½ had measles, colds, and stomach trouble; at 8 had granular conjunctivitis on left lower lid; between 8 and 8½ bad colds; 10–11 tonsils enlarged; condition otherwise good.

12. At entrance health excellent; has had mumps, chicken pox, scarlet fever, whooping cough, measles, 4 or 5 attacks of tonsillitis; from 7 to 8 tonsils enlarged; tonsillitis, under care of physician; 8–9 health good; at 10 condition fair; at 11 shoulders round; has not grown; perfectly well; at 15 left cervical gland palpable.

13. Has had measles, whooping cough, several attacks of tonsillitis; at 6 internal strabismus; advised to see occulist; sensitive disposition; at 7 wearing glasses; at 8 condition good; heart slow and irregular; restless; follicular conjunctivitis; at 9 slight spinal curvature; adenoids and tonsils removed at 8½; nervous, imaginative, cries easily.

14. Health good at entrance; has had no diseases or injuries; at 11 nutrition moderate; at 13 had fall injuring ear, causing hemorrhage, but hearing not injured; at 14 condition fair; improved at 15. Parents American.

15. Health excellent at entrance; and has had measles, chicken pox, whooping cough; tendency to nervousness; condition good; slight spinal curvature.

Notes on physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts IVa and IVb (pp. 42, 55).

Those appearing in the group of 100, Tables 4 and 5, are: 2=95; 3=46; 4=38; 5=37; 6=20; 9=22; 10=55.

1. Health good; has had measles, chicken pox, bronchitis; heart overactive when 13 and gymnasium work suspended.

2. Health good.

3. Subject to colds; between 11 and 12 tonsils enlarged (note slight arrest in growth in height and weight and lung capacity); at 10 had measles.

4. Health good; slightly nervous heart. Parents American.

5. Health good; measles at 7 years 6 months (no apparent evil effect in growth); heart overactive at 9; slight eye trouble later. Parents American.

6. Health good; has had children's diseases. (No data to explain arrest at 8 years 6 months.)

7. Health good; wears braces on legs.

8. Health fair; has had eczema, pneumonia, whooping cough, chicken pox, measles, and mumps; subject to catarrh; asthmatic tendencies.

9. Health good.

10. Health good; has had children's diseases; tonsils removed when 13 (note subsequent increases in growth in height and weight); menstruation began when 16. Parents American.

11. Health good; inclined to be nervous; subject to tonsillitis; eyes weak.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts Va and Vb (pp. 43, 56).

Those appearing in the group of 100 in Tables 4 and 5 are: 1—49; 3—97; 4—92; 9—17; 10—23.

1. At entrance health good; had had infantile diseases and pneumonia, adenoids removed; first menstruation at 11½; nervous temperament; back not strong; at 13 back straighter; hips prominent; at 13½ advised to improve standing.

2. Bad position; more exercise advised; joints flexible; has had pneumonia, measles, and chicken pox in early childhood; right arm broken three times; adenoids and tonsils removed between 11 and 11½ (note increase in height and weight following operation).

3. Thin and delicate until entering school; diphtheria when small; round shoulders during later school life (note flattening of height curve). Parents American.

4. Average health; father died of apoplexy; subject to catarrh and sore throat (note gradual decrease in weight curve). Mother American, father Danish.

5. Health very good, but appetite small; measles and whooping cough, but no apparent evil effects; slightly rapid heart beat at 11½. Parents American.

6. Health fair; has had measles, pneumonia, typhoid fever, chicken pox; shoulders round. Parents American.

7. Health good; standing position poor; studying very hard at 11.

8. Health good; standing position poor in later school life (note effect on height curve, but no effect in weight curve).

9. Health good from 10 to 15; heart slightly overactive; somewhat anæmic; spine slightly irregular; had jaundice at 17.

10. Health good. Parents American.

11. Health good; apparently late appearance of menstruation. Mother Swiss, father French.

12. Health good. Parents American.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts VIa and VIb (pp. 44, 56).

Those appearing in the group of 100 in Tables 4 and 5 are: 1—99; 3—42; 4—98; 6—40; 7—30; 9—72; 10—16; 11—10; 12—18.

1. Has had children's diseases with no apparent ill effect; grew "too fast" at 11 (note acceleration in height curve); at 14 was taking osteopathic treatment for backache (note arrest in growth in height and weight at 13½); appetite poor.

2. Has had scarlet fever, whooping cough, measles, chicken pox, mumps, tonsillitis, and enlarged glands; slight curvature of spine; weak heart at 17; a tall thin girl. (Compare curves in height and weight and small lung capacity.)

3. Anæmic, nervous; heart skipped 1 in 18 or 20 beats when 7; menstruation commenced at 13¼. Parents American.

4. Health good, but had pneumonia and malaria in early childhood; posture poor at 16.

5. Health good; has had children's diseases; ill between 13 and 14; posture [illegible] and shoulders round. (Note drop in height curve after 14.) Parents [illegible]

6. Health good.

7. Small; adenoids removed when about 8 (note slight arrest i
weight); at 10 had typhoid fever (note acceleration in weight f

8. Health on entering school good and had had childre
at 14 with typhoid fever (note slight arrest in height an
fat with stooped shoulders.

9. Health good; shoulders round (note flattening of height curve).

10. Health good; has had pneumonia, scarlet fever, and typhoid fever; very thin at 10 and posture poor at this time; flat feet. Parents American.

11. Tonsils and adenoids removed when 6; condition good, but takes cold easily. Parents American.

12. Ruptured and delicate; when 7 had severe case of scarlet fever.

13. Health good; has had pneumonia, diphtheria, and other diseases as a child; stomach trouble; posture poor.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts VIIa and VIIb (*pp. 45, 57*).

Those appearing in the group of 100 in Tables 4 and 5 are: 1—100; 2—86; 3—81; 4—83; 5—74; 6—73; 7—56; 8—65; 9—59; 10—52; 11—51.

1. Had pneumonia previous to entering school, and adenoids removed; health good; first menstruation at age of 12; back not strong; standing posture poor at 14 and later (note flattening of curve in height); nervous temperament; more outdoor exercise advised. Mother American, father English.

2. Had several children's diseases; liver and nervous troubles; from 14 to 15, stomach trouble (note arrest on increase in weight curve).

3. Health good all the time; standing posture poor.

4. Delicate and nervous; adenoids removed just before 13 (note subsequent increase in growth, in height, and weight). Parents American.

5. Mother died of tuberculosis; enlarged glands on both sides of neck; catarrh; nervous (note decided arrest in growth in height after 13 and decrease in weight after 15½ years). Parents American.

6. Has had children's diseases; hereditary tendency to bleed; irregular menstruation periods. (Note arrest in growth in height after 12 years and in weight after 14.)

7. Has had malaria and children's diseases; had an apparent attack of appendicitis between 11 and 12 (note effect on height); menstruation began between 15 and 16. Parents American.

8. Has had chicken pox, measles, whooping cough, scarlet fever, tonsillitis; health good when entering school, but later stomach trouble and anæmic (note arrest in growth in weight and height). Parents American.

9. Health good in early school life; later anæmic; weak spine; jaundice at 17. (Note arrest in growth in height and weight after 13.) Parents American.

10. Health apparently good. (Note arrest in growth in height.)

11. Has had children's diseases, whooping cough, chicken pox; tonsils enlarged at 13½. Shoulders round at 15½. Slight lateral curvature; heart rapid; nearsighted. (Note light weight.) Mother American, father German.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts VIIIa and VIIIb (*pp. 46, 57*).[1]

Those appearing in the group of 100 in Tables 13 and 14 are: 1—148; 3—142; 4—193; 6—157; 9—176; 10—162; 11—151; 12—117.

1. Had pneumonia between 9 and 10; heart weak. Parents and grandparents American.

2. Parents and grandparents American.

3. Parents and grandparents Russian.

4. Parents American, maternal grandparents English, paternal grandmother English, paternal grandfather American.

5. Parents and grandparents Russian.

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[1] In Charts VIII–XII, inclusive, the nationality of parents [illegible] grandparents is included in the health notes. In many cases in Charts VIII and IX data on the [illegible] condition of the individuals included were [illegible] ing.

6. Parents and grandparents German.

7. Mother German, father American, grandparents German.

8. Parents and grandparents German.

9. Parents American, maternal grandmother American, maternal grandfather Welsh, paternal grandmother German-French, paternal grandfather German.

10. Parents American, maternal grandmother Scotch, maternal grandfather English, paternal grandparents German.

11. Mother Danish, father American, maternal grandparents Danish, paternal grandmother French, paternal grandfather German.

12. Anæmic; trouble with throat and glands at 10; nervous. Parents and grandparents American.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts Xa and Xb (pp. 48, 58).

Those appearing in the group of 100 in Tables 4 and 5 are: 2—89; 3—48; 6—78; 7—19; 9—66; 10—64; 11—1; 12—57.

1. Apparently normal. Parents American, grandparents German.

2. At 12 had chicken pox, subject to colds in the head and nose bleed; at 14 subject to colds, loss in weight. Mother Swedish, father Norwegian, maternal grandparents Swedish, paternal grandparents Norwegian.

3. Before 6 had had measles and chicken pox; subject to colds and earache; at 11 very tall. (Compare height and weight.) Parents American, maternal grandmother Scotch-Canadian, maternal grandfather American, paternal grandparents American.

4. At 11½ had had mumps, measles, and tonsillitis; at 14 good physical condition. Parents American, maternal grandparents German, paternal grandparents German-American.

5. Has had measles, mumps, whooping cough, and chicken pox; at 13½ had grown rapidly; muscular system weak. Parents and grandparents American.

6. Before 12 had had mumps, measles, and whooping cough; subject to sore throat, cold, headaches, earache; at 15 slightly underdeveloped. Parents American, grandparents German.

7. At entrance poorly nourished; at 9½ had had whooping cough and chicken pox; at 11 below normal weight; at 12½ had measles. Parents and grandparents American.

8. At entrance had had chicken pox; condition normal. Parents and grandparents American.

9. At 11 general condition good, and had had grippe, mumps, measles, earache; subject to colds; at 12 condition excellent; at 13 had bronchial colds; at 13½ condition improved after removal of adenoids; at 16 general health excellent. Parents American, maternal grandmother American-English-French, maternal grandfather American-English-Scotch, paternal grandparents American-English.

10. At entrance pale, nervous, oversensitive, taking treatment for nose and throat, no appetite; before 13 had had mumps, whooping cough, chicken pox, and diphtheria; after 16 condition good. Parents American, maternal grandparents Welsh, paternal grandparents American.

11. Health excellent. Parents and grandparents German.

12. Before 15 had had measles and chicken pox; subject to bilious attacks and headaches. Mother German, father German-American, grandparents German.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts XIa and XIb (pp. 49, 59).

Those appearing in the group of 100 in Tables 4 and 5 are: 1—43; 2—82; 5—96; 7—91.

1. At 10 had chicken pox; subject to cold in the head. Mother American, paternal grandmother Irish, paternal grandfather English.

2. Has had measles, chicken pox, mumps; subject to sick headaches at 14. Parents American, maternal grandparents English, paternal grandparents German.

3. Has had measles, mumps, scarlet fever, diptheria; adenoids removed between 11 and 12; at 13 subject to headache from eyes, sore thioat, tonsillitis, backache, and nose bleed.

4. Good health.

5. Poor carriage; arrested development. Parents American, both grandmothers American, both grandfathers German.

6. Mother Canadian, father American, maternal grandmother American, maternal grandfather Canadian, paternal grandparents English.

7. At 14 had had mumps, measles, whooping cough, chicken pox, and penumonia. Parents American, maternal grandmother American, maternal grandfather English, paternal grandmother American, paternal grandfather Irish.

8. Had measles at 14½ and later hernia. Parents American, grandparents American of Irish descent, paternal grandparents American, of Holland, Scotch, French, and English descent.

9. General condition good. Parents and grandparents American.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts XIIa and XIIb (pp. 50, 59).

Those appearing in the group of 100 in Tables 4 and 5 are: 3=41; 7=21; 8=15; 9=13; 10=62.

1. At entrance had had measles, whooping cough, chicken pox; very heavy, fat, slow of movement. Parents American, grandparents German.

2. At entrance had had mumps, chicken pox, and measles. Parents American, maternal grandmother American, maternal grandfather American-Canadian, paternal grandparents American.

3. At 12 had had scarlet fever. Parents and grandparents American.

4. At entrance had had measles, whooping cough, chicken pox, grippe; tonsils removed at 7½; between 9 and 10 suffered much colds; after this improvement. Parents American, maternal grandmother American, maternal grandfather American-Canadian, paternal grandparents American.

5. Before 8 had had measles, whooping cough, chicken pox; fat, overweight.

6. At entrance had had whooping cough, measles, scarlet fever, chicken pox; between 12 and 13 heart trouble, out of school three-fourths of the time. Mother German-American, father Norwegian-American, maternal grandparents German; paternal grandparents Norwegian.

7. At 7 had had mumps; at 13 condition normal. Parents American, maternal grandmother English, maternal grandfather Welsh, paternal grandmother Irish, paternal grandfather Scotch-English.

9. Between 8 and 9 had pneumonia; poorly developed; after 11 improvement; at 13 eyes poor; underweight.

10. At 11½ had had diphtheria, chicken pox, mumps, measles, pneumonia; subject to rheumatism; slightly improving.

11. At 15 had had whooping cough, measles, subject to headache and sore throat; at 17 sore throat.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts XIIIa and XIIIb (pp. 51, 60).

Those appearing in the group of 100 in Tables 4 and 5 are: 1=60; 2=44; 4=36; 5=88; 6=27; 8=6.

1. Strong and healthy; adenoids and tonsils removed [illegible] before 12; first menstruation at 12.

2. Tonsils enlarged from 10 to 11; first menstruation [illegible] years 5 months. Parents and grand[illegible] American.

8. We[illegible] arches; first menstruation a[illegible] [illegible]rents and grandparents Americ[illegible]

4. Adenoids removed at 9 years 8 months, and again at 13½; first menstruation at 13 years 9 months. Parents American, maternal grandparents American, paternal grandmother American, paternal grandfather Canadian.

5. Stooped shoulders, but general health good; first menstruation at 15 years 3 months 17 days.

6. Poor health at 12 years 5 months; first menstruation at 16 years 1 month. Parents American, maternal grandmother American, maternal grandfather English, paternal grandparents American.

7. Adolescent heart at 16; otherwise normal; first menstruation 14 years 6 months.

8. Had first menstruation at 14. Mother American, father German-American, maternal grandparents American, paternal grandparents German.

9. First menstruation at 16 years 7 months. Mother American, father Canadian, maternal grandparents American, paternal grandparents Scotch.

10. Enlarged tonsils at 14; excused from gymnasium work at 15; first menstruation at 13 years 4 months.

Notes on the physical condition of individuals whose curves in height, weight, and lung capacity are given in Charts XIVa and XIVb (pp. 52, 60).

Those appearing in the group of 100 in Tables 4 and 5 are: 6—32; 12—85.

2. Stoop shoulders at 9; arches of foot broken between 12 and 13. Parents and grandparents American.

3. Tonsils enlarged after 11, removed at 12 years 9 months; posture poor; first menstruation at 12 years 7 months. Parents and grandparents American.

4. Tired, weak; matured at 15. Mother American, father Canadian, maternal grandparents Scotch, paternal grandmother English, paternal grandfather Scotch.

5. General condition excellent; at 12 had mumps.

6. Health in infancy poor; had rickets; at 10 attack of measles; enlarged tonsils after 10, at 14 left tonsil still enlarged; first menstruation at 12 years 9 months. Mother English-Scotch, father German, maternal grandmother Scotch-English, maternal grandfather English, paternal grandmother English, paternal grandfather German.

7. Apparently normal.

8. Weak heart; otherwise normal. Parents and grandparents American.

9. At 6 had measles; at 10 adenoid growths; tonsillitis between 10 and 11; first menstruation at 13 years 1 month. Parents and grandparents American.

10. Apparently normal; poor eyesight. Parents and grandparents American.

11. Nothing unusual. Parents and grandparents American.

12. At 12 spine very crooked, at 14 straight; menstruation began at 14. Parents and grandparents American.

(C) INDIVIDUAL WEIGHT-HEIGHT AND VITAL INDICES.

TABLE 23.—*Weight-height and vital indices.*[1]

[The hundredths denote weight-heights; the thousandths denote vital indices.]

FOR CHARTS IIa and IIb (HORACE MANN BOYS).

	Years of age.																								
	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
	0.19 .069		0.21 .067		0.23 .061		0.24 .067		0.24 .070																
		0.19 .049			.21 .054			0.22 .062		0.23 .062		0.25 .060													
3	.16 .061	.17 .061			.18 .056	0.18 0.69		.19 .073		.21 .070		.23 .068		0.24 .071		0.26 .068				0.27 .074					
4																.28 .063	0.31 .060		0.34 .052		0.37 .077		0.40 .075		0.41 .075
5													0.25 .053		0.27 .056		.28 .055		.29 .055		.34 .057		.37 .058		.38 .055
6											0.19		.20 .077	.20 .077			.21 .079		.24 .087	.27 .088		0.28 .088			.28 .097
7	.20 .052		.19 .051		.19 .061		.20 .063		.21 .064		.22 .063	.24 .065													
8																									
9		.18 .060		0.19 .066				.20 .060		.22 .060															
10													.18 .065		.19 .064		.21 .065		.23 .066		.26 .070		.29 .075		.32 .071
	.16		.17 .060		.18 .066		.20 .065		.20 .063		.21 .070		.22 .065		.24 .066		.27 .066		.30 .064			.34 .066			
	.17 .019	.17 .049		.17 .061		.19 .060		.23 .058		.25 .057		.25 .057				.28 .052									
							.20		.21 .064		.22 .064	.23 .057			.25 .056		.26 .062		.28 .058		.28 .064		.31 .059		.35 .066
								.17 .052		.18 .062		.19 .059		.21 .052		.24 .056		0.27 .057		.29 .062		.33 .058		0.33 .060	
															.25 .066		.26 .072		.27 .066	.29 .068		.32 .074	.34 .078		.35 .078

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[1] The table for charts Ia and Ib may be found on page 63.

Table 23.—*Weight-height and vital indices*—Continued.

FOR CHARTS IIIa and IIIb (HORACE MANN BOYS).

	Years of age.																								
	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
1				0.21 .050		0.23 .061		0.25 .062	0.25 .063	0.26 .060	0.27 .063	0.28 .065		0.34 .061		0.35 .053			0.38 .067						
2			0.18 .066		0.19 .066		0.21 .063		.22 .064		.24 .064		0.25 .065		0.27 .065										
3													.25 .052		.25 .061	.28 .057					0.33 .061		0.37 .062		
4								.21 .054		.21 .063		.23 .066		.24 .066		.26 .062		0.29 .062		0.33 .063			.37 .070		
5					.20			.061	.23 .056		.23 .063		.25 .055		.30 .052		0.33 .046		.37 .050						
6		0.19 .037	.21 .045			.20	.21 .048			.24 .046	.25 .046			.27 .044		.29 .043					.30 .054				
7											.22 .055		.23 .062		.24 .057	.24 .059		.27 .061		.29 .063		0.30 .064			
8											.19		.20 .051		.21 .061	.23 .059			.26 .058	.27 .059		.29 .064		0.32 .064	
9												.23 .056		.25 .065		.28 .064		.31 .066		.30 .072		.31 .071		.33 .078	0.33 .082
10													.19 .068	.19 .076		.21 .067		.24 .073		.27 .071		.30 .073		.32 .071	.33 .072
11			.17 .056		.18 .056		.18 .063		.19 .067	.20 .055		.20 .062		.21 .063		.23 .061									
12		.14				.16 .060		.17 .062		.17 .061		.18 .066		.20 .060				.21 .055		.23 .058					
13		.16 .046		.17 .050		.17 .048		.18 .044		.19 .043		.20 .045		.20 .047											
14										.19		.19 .059				.23 .062		.22 .060		.23 .066		.26 .055	.29 .063	.32 .062	
15					.16		.17 .058		.17 .070		.18 .070		.19 .065		.19 .071		.21 .065		.23 .063						
Average	0.178	.176	.188	.187	.195	.195	.204	.202	.201	.218	.23	.224	.232	.234	.253	.259	.273	.269	.302	.274	.328	.310	.351	.334	.352
Average	.0516	.0518	.0588	.0564	.0588	.0653	.0622	.0578	.0629	.0581	.0612	.0610	.0616	.0621	.0613	.0596	.0613	.0610	.0622	.0652	.0639	.0668	.0681	.0655	.0730

FOR CHARTS IVa and IVb (HORACE MANN GIRLS).

	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
1							0.24 .046			0.25 .063		0.25 .065	0.29 .063		0.30 .060		0.31 .058		0.35 .052		0.40 .053		0.40 .053		0.44 .051

1																									
2							.18 .025		0.20 .055		0.22 .052	.20 .064		0.27 .047		0.29 .048			.30 .054	0.33 .055	.33 .056		.34 .055		.34 .057
3			0.24 .039		0.23 .057		.26 .045		.28 .050		.30 .047		.34 .043		.36 .056		.36 .057		.36 .058						
4			.19 .049		.19 .054		.20 .055		.22 .053		.22 .060		.26 .053		.30 .062		.32 .065								
5		0.17 .059			.18 .057	0.19 .058			.20 .064		.21 .064		.23 .063		.24 .063	.26 .066									
6				0.18 .030			.20 .043		.20 .043		.24 .040	.26 .041		.30 .040	.34 .037		.33 .037		.37 .035	.39 .037		0.41 .035			
7										.22 .047		.23 .056		.25 .053		.28 .057		0.30 .053			.34 .051	.37 .051			
8											.22 .052		.22 .056		.23 .060				.28 .052		.31		.34 .050	0.33 .054	.33 .053
9		.18			.18 .055	.19 .055		0.20 .056		.23 .055		.23 .056		.24 .053		.27 .055		.31 .049		.31 .053					
10											.18 .049		.18 .055		.19 .053	.19 .054		.21 .055		.24 .056			.25 .059		.27 .057
						.20 .034		.18 .052	.19 .061		.20 .060		.22 .054		.25 .052		.30 .048		.33 .050		.36 .048		.38 .045		

FOR CHARTS Va and Vb (HORACE MANN GIRLS).

	0.16		0.18 .038	0.19 .050		0.19 .050		0.24 .040		0.25 .046		0.27 .038		0.28 .048		0.31 .046		0.36 .047					0.39 .049		
2										.20 .066		.21 .069		.23 .060		.25 .069		.29 .069		0.30 .073			.29 .063		
3									0.19 .055		0.22 .054		0.26 .048	.24 .063		.27 .060		.30 .060		.33 .057			.35 .057		0.36 .053
4												.25 .052		.26 .053		.29 .057		.32 .054		.38 .048		0.34 .058		0.35 .057	.34 .059
5	.22 .046		.22 .058		0.24 .056		0.26 .056		.27 .056		.30 .057		.31 .053		0.33 .052										
6	.16 .054					.16 .060		.17 .068		.18 .069		.19 .061													
7		0.20 .039		.21 .039		.24 .040		.29 .042		.33 .041		.32 .043		.34 .040		.40 .040		.41 .042							
8														.22 .061		.24 .058		.25 .059		.27 .060		.29 .057		.29 .064	.30 .062
9				.22 .038		.23 .045		.23 .046		.25 .040		.25 .047		.27 .050				.33 .050		.37 .045			.39		
10			.17		.18 .077		.17 .079		.18 .083	.18 .085		.20 .078		.22 .080		.25 .079		.29 .069		.31 .067					.31
....															.26 .049		0.28 .046		0.33 .046		0.34 .040		.36 .050		.38 .045
	.11		.17 .054		.19 .060		.19 .063		.20 .059		.22 .052		.23 .060		.27 .059		.29 .057								

TABLE 23.—*Weight-height and vital indices*—Continued.

FOR CHARTS VIa and VIb (HORACE MANN GIRLS).

	Years of age.																								
	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
1										0.22 .051		0.25 .060	0.27 .052		0.29 .057		0.30 .059		0.30 .058		0.30 .062		0.32 .058		
2																	.29 .049		.32 .047		.33 .051		.35 .049		0.36 .049
3					0.19 .061		0.20 .061		0.23 .052		0.23 .058		.25 .049		.27 .053		.30 .059		.33 .060						
4								0.23 .046		.27 .048		.28 .053	.30 .056		.30 .049		.40 .051		.43 .051		.44 .051		.48 .040		
5													.23 .065			0.26 .065	.28 .063		.30 .067		.32 .062		.34 .062		.32 .067
6		0.18			.20 .065			.23 .051		.23 .062		.24 .066		0.26 .059		.27 .062		0.29 .055		0.31 .051					
7				0.18 .043		0.19 .053	.19 .057			.22 .051		.26 .046		.29 .045		.32 .043		.34 .041		.37 .044	.36 .053				
8							.27 .039			.29 .041	.32 .037	.35 .038		.40 .036		.43 .040				.42 .046		0.47 .043			.48 .037
9							.19 .054		.21 .059		.21 .059	.22 .049		.23 .053			.26 .053	.28 .050		.31 .047		.32 .047		0.33 .048	
10		.14 .019		.16 .059		.16 .053		.17 .049		.19 .061		.20 .051		.22 .043		.25 .059		.26 .057							
11				.20 .048		.20 .050		.21 .048		.22 .049		.24 .053		.26 .048		.29 .050		.31 .044							
12	0.13		0.14 .040		.15 .044		.16 .054		.17 .055		.19 .055		.20 .054		.23 .057		.28 .053								
13																		.22 .054		.24 .049		.26 .054	.27 .054	.27 .052	.28 .057

FOR CHARTS VIIa and VIIb (HORACE MANN GIRLS).

	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
													0.27 .047			0.28 .049	0.33 .040	0.35 .040			0.35 .044		0.34 .046		0.33 .047
											0.22 .060	0.23 .063		0.27 .063		.27 .060		.29 .066		0.30 .061		0.30 .068		0.34 .067	
										0.30 .034			.29 .043	.30 .044		.31 .048		.36 .042		.38 .039	.37 .052	.34 .052		.37 .050	
										.19 .053		.19 .062		.21 .060		.22 .065	.24 .060	.26 .067		.28 .063		.30 .065		.32 .061	

									0.21		.25		.28		0.32		.34		0.34		.39		.36		.40
									.050		.046		.044		.044		.044		.047		.040		.048		.040
								0.20		.23		.25		.29		.33		.35		.33		.33		.32	
								.050		.050		.041		.045				.044		.050		.051		.053	
									.20			.22		.22	.22		.27		.28		.30		.32		.32
												.044		.066	.060		.051		.057		.058		.056		.060
											.21		.23		.24	.25		.28			.28	.29		.28	
											.050		.055		.054	.055		.055			.060	.061		.063	
								.18			.19	.21		.23		.27		.28		.29		.27		.28	.27
								.056			.060	.054		.060		.060		.057		.058		.061		.062	.062
								.19		.23		.24		.26		.29		.31		.36		.36		.37	
								.056		.048		.050		.046		.048		.048		.046		.044		.045	
11											.18			.18		.18	.20		.23		.22	.23	.24	.24	
											.053			.065		.072	.075		.075		.075	.074	.073	.079	
	0.156	0.174	0.187	01.91	0.193	0.195	0.208	.187	.225	.216	.226	.240	.255	.245	.274	.278	.298	.302	.310	.323	.337	.325	.342	.314	.364
	.0500	.0390	.0463	.0434	.0837	.0498	.0520	.0507	.0567	.0530	.0532	.0538	.0533	.0531	.0542	.0548	.0539	.0530	.0539	.0526	.0535	.0548	.0539	.0580	.0535

FOR CHARTS VIIIa and VIIIb (FRANCIS W. PARKER BOYS).

				0.19	0.19			0.21	0.22	0.22	0.23	0.23		0.25	0.26								0.36		
				.056	.029					.070	.074	.063		.061	.066								.067		
								.21	.22	.21	.22	.23			.24		0.26		0.29						
										.066	.064	.063			.062		.062		.070						
			0.21		.22	0.24	0.26			.30	.31	.31	0.32	.36	.37	0.41	.41	0.43							
							.052				.050	.050	.052	.050	.050	.050	.050	.050							
														.27		.30		.32	.33		0.36	0.37		0.40	
														.054		.055						.062		.061	
								.24	.24	.26	.31			.33	.33	.34	.34	.37	.39	0.43	.43				
								.061	.061	.063	.055			.053	.055	.052	.060	.059	.058	.056	.061				
									.22	.22		.23		.23		.25	.26				.32	.36		.37	0.35
									.050	.055						.059	.063				.069	.069		.071	.074
							.19	.19	.20	.20	.21			.23	.25	.24	.26	.28	.29	.31	.32				
									.056	.060	.058			.060	.057	.059	.058	.060	.064	.065	.070				
																.24	.25	.28		.29	.31	.34	.35		.35
																.080	.065				.069	.070	.065		.070
9														.22		.23		.25	.27	.30	.32	.32		.33	.34
														.066		.059				.055	.056	.060		.065	.064
10													.22		.21		.23		.28	.29	.30	.33	.34	.35	
																	.065		.067	.069	.068	.063	.072	.070	
11														.21	.22	.23	.26		.28	.29	.31		.33		.34
														.061	.055	.056	.062		.061	.066	.065		.068		.071
12				.16		.16					.17	.18	.19		.19										
				.056		.053					.071	.064	.066		.066										

TABLE 23.—*Weight-height and vital indices*—Continued.

FOR CHARTS IXa and IXb (FRANCIS W. PARKER BOYS).

	Years of age.																								
	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
1		0.19	0.19			0.19	0.19	0.19	0.20	0.21		0.23	0.24	0.24	0.25	0.25	0.28	0.29		0.32	0.36				
		.050	.050					.050	.051	.060		.061	.056	.054	.066	.069	.070	.072		.072	.063				
2				0.21	0.22			.22	.23	.23	0.24	.25	.27	.29	.29		.28	.30	0.33		.35				
				.040	.043					.055	.057	.057	.054	.053	.055		.057	.059	.055						
3														.23			.25		.28	.32	.32	0.32	0.33		
														.075			.065				.073	.080	.032		
4															.24		.24		.29	.30	.31	.32			
																				.062	.060	.033			
5												.22	.22	.23	.23	.25		.29	.32						0.35
														.066	.065	.059		.067	.067						.070
6					.18	.18					.22	.23	.24	.24	.24		.27	.30	.30						.37
					.096	.090							.060	.070	.67		.057	.063	.060						.075
7													.21		.23		.24	.25	.26	.28	.29		.31	0.32	
															.058				.064	.061	.062		.064	.040	
8			.18		.18		.20	.20	.20		.21	.22		.23		.25	.26	.28							
			.094				.050	.053	.057		.054	.060		.048		.057	.052	.056							
9														.24	.24	.25	.25	.28		.30	.32			.36	.37
																.076	.071	.057		.060	.054			.062	.069
10											.20	.20	.21	.22		.23	.24	.24		.27	.28	.34	.30		
											.059	.059	.055	.058		.063	.052	.058		.058	.060	.057	.060		
11									.19	.20			.20	.21	.21	.21	.22		.23	.24	.27	.27	.29	.29	.30
									.026	.028					.070	.060	.060		.065	.075	.063	.062	.067	.072	.075
12		.18	.19					.20	.21	.21		.22	.24	.23	.25		.26	.26	.26	.29					
		.075	.090					.045	.045	.068		.068	.064	.066	.060		.064	.060	.072	.045					
13															.21	.21		.24	.24		.25	.25	.29	.30	.33
																		.049	054		.060	.056			.062
14				.18			.18	.20	.20	.20		.20	.29	.22	.22	.21	.22		.24						
				.098				.059		.050			.039	.056	.058	.060	.060								
Average		.185	.192	.185	.198	.192	.204	.206	.211	.223	.232	.227	.240	.246	.246	.256	.264	.222	.287	.302	.317	.323	.322	.340	.344
Average		.0625	.0780	.0625	.0560	.0715	.0510	.0536	.0494	.0575	.0602	.0602	.0557	.0631	.0606	.0605	.0607	.0591	.0630	.0620	.0634	.0612	.0618	.0630	.0700

FOR CHARTS Xa and Xb (FRANCIS W. PARKER GIRLS).

	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
1							0.20	0.21		0.22	0.24	0.24	0.25	0.27	0.28	0.30		0.31							
								.042		.044	.050	.063	.056	.057	.051	.051		.037							

2										.23		.23	.23	.25		.25	0.29		0.28	0.28		0.30	0.32	0.32	0.31
										.051				.060		.060	.052		.054	.060		.060	.056	.053	.054
3			0.16		0.17	0.17	.17	.18	0.19		.19	.19	.20	.21			.24		.25						
			.045				.063	.065	.063		.060	.063	.070	.067			.066		.056						
4										.21		.23	.24	.24	.26	.26		.28	.31		0.34				
										.050				.061	.058	.065		.059	.060		.060				
5																	.24	.24	.29	.27	.28		.29	.30	.30
																	.070	.072	.051	.054	.058			.061	.063
6								.17		.18	.18	.19	.20	.20		.22	.24		.26	.27	.28	.27	.28		
								.064				.061	.080	.060		.060	.060		.061	.056	.063	.059	.060		
7				0.17	.16			.18	.18	.18	.19	.19		.22	.22	.24	.26	.25		.31	.29	.29			
				.053	.070					.077	.080	.079		.067	.080	.080	.080	.082		.070	.074	.072			
8		0.17	.18	.18		.18		.20	.22	.21		.22	.24	.26	.27	.29									
						.049		.039	.055	.064		.055	.053	.055	.061	.054									
9						.18	.19	.20		.21	.21	.24	.24	.25		.29	.31	.33	.36	.37	.35	.38	.45	.41	
						.050	.060	.050				.052	.061	.057		.057	.060	.058	.054	.064	.059	.055	.055	.047	
10										.19	.19	.19	.20	.20		.24	.27	.27	.27	.28		.30	.30	.32	.34
										.085	.084	.065	.058	.059				.060	.060	.060		.054	.054	.053	.051
11			.15	.17			.17	.17	.17	.18	.19		.19	.20	.22	.23	.23	.26	.27	.28	.29				
			.053	.055					.060	.063	.051		.054	.056	.034	.036	.036	.032	.036	.035	.034				
12												.18	.20	.20	.21	.19		.22	.23	.25	.25		.27	.24	.29
														.059	.055	.062				.060	.058		.060	.060	.065

FOR CHARTS XIa and XIb (FRANCIS W. PARKER GIRLS).

1				0.19	0.19	0.20		0.20		0.20	0.21	0.21	0.22	0.27	0.26		0.29	0.31		0.28		0.31			
				.041	.053	.032					.060	.068	.064	.058	.056		.058	.051		.063		.060			
2										.18	.19	.20	.20	.20		0.24	.25	.25	0.27	.28		.28	0.28	0.28	0.29
												.056	.065	.056				.052	.054	.050		.052	.058	.057	.060
3								.20	0.23	.23		.26	.28	.29	.32	.31		.34	.36		0.37				
								.058	.048	.050				.050	.051	.053		.053	.050		.051				
4							.017	.20	.22		.23	.23	.23		.25	.28	.28	.28	.29	.32					
								.058	.059		.059	.058	.059		.061	.061	.062	.067	.068	.059					
5										.23	.25	.26	.28	.27		.31	.32	.31	.32	.33	.34	.34	.33	.33	.34
										.070	.072	.050	.040	.048				.053	.050	.052	.045	.052	.056	.057	.055
6									.19			.22	.23	.25	.28	.27	.27	.28		.30					
									.052			.047	.049	.051	.050	.052	.057	.060		.041					
7															.25		.26	.30	.33	.33	.35		.35	.34	.36
															.060				.056	.058	.059		.055	.060	.060
8									.20	.21	.21		.23	.24	.26	.27	.30		.31	.30					
									.061	.055	.057				.066	.060	.053		.056	.062					
9									.20	.20	.20	.20	.22	.25	.23	.25		.26	.29		.32	.33			
												.061	.055			.064		.060	.057		.057	.056			
Average		0.17	0.163	.177	.173	.182	.180	.191	.200	.217	.206	.216	.226	.273	.254	.261	.270	.280	.293	.295	.316	.311	.318	.317	.318
Average			.049	.0496	.0615	.0436	.0615	.0537	.0568	.0609	.0636	.0598	.0587	.0575	.0569	.0575	.0594	.0568	.0548	.0562	.0543	.0577	.0567	.0560	.0581

TABLE 23.—*Weight-height and vital indices*—Continued.

FOR CHARTS XIIIa and XIIIb (UNIVERSITY OF CHICAGO GIRLS).

	Years of age.																								
	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½
1			0.21 .055	0.22 .052	0.23 .051	0.25 .050	0.25 .039			0.29			0.37 .033	0.39 .022			0.40 .050					0.40 .051	0.41 .051		
2					.20	.22 .040	.21	0.22 .046		.24 .058		0.26 .056	.27 .060	.28 .059											
3						.19	.20 .042	.21	0.22	.22			.25	.27 .050		0.29 .055	.31 .050	0.32 .052	0.33 .050		0.34 .048		.33 .058		
4			.19 .041		.19	.20 .023	.20		.20 .040	.23 .050		.23 .066	.23 .075		0.25 .061	.26 .060	.27 .061								
5													.25 .026			.31		.34 .033	.34 .033	0.34 .038	.35 .035		.36 .036	0.36	0.38 .040
6					.19 .052	.18 .060	.18 .056	.19 .060	.20 .049	.20		.20			.21 .060	.21 .036	.21 .039		.23 .057		.27 .054	.27 .054			
7								.19 .053	.19		0.20 .050		.20	.21	.20		.24 .045	.24 .050	.20 .054			.28 .050			.31 .050
8		0.15 .035			.16		.16 .050	.17 .053	.17 .050		.18 .060			.19 .055	.20 .055	.21 .053		.23 .053							
9																		.22 .056	.23 .052	.23 .054		.24 .063	.27 .061	.28 .057	.29 .058
10								.21			.21	.21		.23 .061	.24 .052			.28 .063	.30 .054	.30 .061	.31 .053	.31 .058			

FOR CHARTS XIVa and XIVb (UNIVERSITY OF CHICAGO GIRLS).

1																									
2						0.18 .045		0.19 .041	0.19					0.24 .059		0.26 .070		0.29 .068		0.30 .067		0.30 .071			
3									.22 .040	0.23 .047		0.24 .050	0.28 .044		0.33 .047										
4																			0.23 .043	.24 .049			0.26 .050	0.27 .051	0.26 .053
5										.22 .041	0.24 .050	.23 .054		.24 .058	.25	.25 .060	0.27 .060		.28 .063						
6				0.19 .029		.19		.20	.21		.23 .046		.23 .041		.25 .053	.28 .048	.34 .046	.34 .050							

7												.21 .050	.20 .050	.23 .054	.23 .052	.24 .045									.32 0.05
8		0.17				.17	0.19		.20		.21 .069	.22 .069				.26 .069		.30 .060							
9						.18 .046	.16	.19	.20			.22	.23 .052		.26 .052	.27 .068	.30 .058			.34 .051		.32 .057			
10							.15	.21 .061	.20 .052		.30 .035			.25 .057							0.31 .045	.32 .046			
11																.21 .045	.24 .058	.28 .054			.30 .056		.29 .057	.32 .048	
12													.19 .040	.20				.23 .030	.24 .034	.25 .033			.27 .057		
Average		.16	0.20	.205	0.194	.195	.188	.198	.200	.232	.224	.224	.245	.248	.243	.254	.286	.279	.252	.254	.313	.305	.312	.307	.312
Average		.035	.098	.0405	.0515	.0440	.0467	.0523	.0462	.049	.0516	.0575	.0467	.0527	.0540	.0553	.0518	.0517	.0477	.0504	.0485	.0563	.0528	.0520	.0502

(D) INDIVIDUAL SCHOOL MARKS AND GRADES.

TABLE 24.—*Marks and grades.*[1]

AVERAGE MARK, GRADE, AGE, AND NUMBER OF CASES—HORACE MANN SCHOOL BOYS.

FOR CHART IIc.

No. of curve.	Age in years and months.	Age in years.																														General average.	Total cases.
		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20			
		Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.		
1	9- 1							88^{3}	32																							88	32
2	11- 2½											82^{5}	38																			82	38
3	8- 9							83^{3}	16	81^{4}	24	83^{5}	44	90^{6}	40	84^{7}	47	88^{8}	24													85	195
4	13-11																	84^{8}	20	74^{9}	15	79^{10}	20	69^{11}	18	72^{12}	19					76	92
5	12- 0													89^{6}	40	82^{7}	44	82^{8}	14	86^{9}	10	80^{10}	14	80^{11}	16	79^{12}	20					83	158
6	10-10											87^{5}	48	88^{6}	40	84^{7}	48	76^{8}	20	80^{9}	20	77^{10}	24	73^{11}	21	81^{12}	18					81	239
7	8- 0							73^{4}	36	78^{5}	40	80^{6}	40	76^{7}	43																	78	175
8																																	
9																																	
10	12- 0													83^{4}	41	83^{5}	44	85^{6}	47	81^{7}	48	78^{8}	20	74^{9}	20	75^{10}	16	77^{11}	20			80	256
11	8-11							87^{3}	28	84^{3}	12	82^{4}	34	83^{5}	44	89^{6}	43	87^{7}	43	85^{8}	9											85	213
12	8- 8							93^{3}	40	82^{5}	39	89^{6}	44	82^{7}	43																	87	166
13	10-11											81^{3}	33	86^{5}	43	87^{6}	48	85^{7}	48	79^{8}	20	80^{9}	26	76^{10}	24	77^{11}	28					81	270
14	9- 6									90	39	85^{4}	36	88^{5}	45	89^{6}	39	81^{7}	48	83^{8}	28	80^{9}	28	83^{10}	28							85	291
15	11- 8													89^{5}	40	91^{6}	39	87^{8}	30	78^{9}	23	64^{10}	20	85^{11}	22	67^{12}	21	78^{12}	18			80	213
FOR CHART IIIc.																																	
1	8- 6							78^{3}	16	71^{4}	33	83^{5}	44	88^{6}	47	84^{7}	44	86^{8}	23													82	210
2	8-11							85^{3}	39	79^{4}	33	78^{5}	48	81^{6}	39	79^{7}	42	76^{8}	24													80	225
3	11- 7													88^{6}	43	87^{7}	46	83^{8}	9	77^{9}	20	64^{10}	20									80	138
4	9- 7									85^{3}	38	83^{4}	33	83^{5}	44	88^{6}	48	85^{7}	44	84^{8}	29	84^{9}	26									85	262
5	10- 0									80^{4}	41	86^{4}	43	84^{5}	35	88^{7}	47	78^{8}	20	76^{9}	17											82	203
6	11- 4											83^{4}	45	83^{5}	44	85^{6}	48	78^{7}	43													82	180
7	9- 9									91^{4}	31	92^{6}	40	92^{7}	44	92^{8}	20	89^{9}	16	87^{10}	25	83^{11}	27	83^{12}	28							89	231
8	9- 8									87^{3}	43	80^{4}	38	87^{5}	48	84^{6}	44	76^{7}	47	65^{8}	23	62^{9}	17	64^{10}	20	73^{11}	6					75	286
9	11- 5											87^{5}	48	91^{6}	42	85^{7}	47	89^{8}	15	85^{9}	18	82^{10}	24	84^{11}	19	78^{12}	20					85	233
10	11-10													68^{5}	44	83^{6}	41	82^{6}	48	83^{7}	47	79^{8}	16	81^{9}	20	76^{10}	20	74^{11}	20			78	256
11	8- 9							80^{3}	39	81^{4}	36	78^{5}	33	84^{6}	48	80^{7}	48	72^{8}	18													79	222
12	9- 5							86^{3}	37	84^{4}	34	82^{5}	44	82^{6}	48	79^{7}	40	73^{9}	22	62^{10}	24											78	249

13	8- 6	....	....	....	....	....	....	81^{3}	40	81^{8}	40	79^{4}	41	69^{5}	44	70^{6}	44	79^{4}	41	69^{5}	44	70^{6}	44	....	....	....	....	....	....	....	....	76	209
14	11- 6	....	....	....	....	....	....	81^{3}	40	81^{8}	40	....	....	83^{6}	44	....	....	84^{6}	39	82^{7}	43	81^{8}	19	78^{9}	19	73^{10}	20	73^{11}	20	78^{12}	18	79	222
15	9-11	....	....	....	....	....	....	....	....	82^{6}	32	81^{4}	42	83^{5}	44	87^{6}	48	84^{7}	48	76^{8}	20	....	....	....	....	....	....	....	....	....	....	82	234

AVERAGE MARK, GRADE, AGE, AND NUMBER OF CASES—HORACE MANN SCHOOL GIRLS.

FOR CHART IVc.

No. of curve.	Age in years and months.	Age in years.																								General average.	Total cases.
		9		10		11		12		13		14		15		16		17		18		19		20			
		Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.		
1	9- 0	88^{3}	36	89^{4}	36	87^{5}	44	85^{6}	40	84^{7}	48	79^{8}	16	81^{9}	20	76^{10}	20	82^{11}	21	85^{12}	20	....	....	....	....	84	301
2	12- 3	....	....	....	....	....	....	83^{8}	24	84^{9}	24	82^{10}	28	81^{11}	28	85^{12}	30	....	....	....	....	....	....	....	....	83	134
3	10- 0	....	....	88^{4}	36	....	....	82^{5}	44	88^{7}	48	87^{8}	24	80^{9}	23	....	....	....	....	....	....	....	....	....	....	85	175
4	8-11	94^{3}	16	91^{4}	42	....	....	93^{6}	47	91^{7}	48	91^{9}	20	....	....	....	....	....	....	....	....	....	....	....	....	92	173
5	8-10	95^{3}	16	93^{4}	28	92^{5}	44	94^{6}	43	93^{7}	43	90^{9}	16	....	....	....	....	....	....	....	....	....	....	....	....	93	190
6	9- 9	....	....	89^{3}	40	91^{4}	40	83^{5}	47	91^{6}	47	90^{7}	48	79^{8}	20	79^{9}	22	80^{10}	20	....	....	....	....	....	....	85	284
7	10- 8	....	....	....	....	78^{5}	48	77^{5}	47	....	....	74^{7}	44	....	....	81^{8}	21	72^{9}	22	....	....	....	....	....	....	76	182
8	10-11	....	....	....	....	92^{4}	37	88^{5}	44	92^{6}	43	86^{7}	48	85^{8}	24	75^{9}	20	82^{10}	24	79^{11}	22	75^{12}	24	....	....	84	286
9	8- 7	94^{3}	34	94^{4}	38	96^{5}	43	95^{6}	48	94^{7}	48	94^{8}	18	94^{10}	20	95^{11}	22	....	....	....	....	....	....	....	....	95	271
10	9-10	....	....	94^{4}	44	88^{5}	44	91^{6}	36	91^{7}	40	84^{8}	20	87^{9}	20	83^{10}	24	79^{11}	23	79^{12}	22	....	....	....	....	86	273
11	10- 1	....	....	86^{4}	41	84^{5}	47	85^{6}	48	90^{6}	47	90^{7}	48	85^{8}	20	82^{9}	22	81^{10}	19	....	....	....	....	....	....	85	292

FOR CHART Vc.

No. of curve.	Age in years and months.	9 Average mark.	9 Cases.	10 Average mark.	10 Cases.	11 Average mark.	11 Cases.	12 Average mark.	12 Cases.	13 Average mark.	13 Cases.	14 Average mark.	14 Cases.	15 Average mark.	15 Cases.	16 Average mark.	16 Cases.	17 Average mark.	17 Cases.	18 Average mark.	18 Cases.	19 Average mark.	19 Cases.	20 Average mark.	20 Cases.	General average.	Total cases.
1	8- 9	84^{3}	38	78^{4}	18	83^{5}	48	84^{6}	44	82^{7}	47	88^{8}	24	88^{9}	30	....	....	....	....	....	....	....	....	....	....	84	249
2	10- 0	....	....	83^{5}	44	84^{6}	48	80^{7}	41	75^{8}	18	77^{9}	20	79^{10}	20	....	....	....	....	....	....	....	....	....	....	80	191
3	9-10	....	....	90^{3}	36	87^{4}	39	89^{5}	44	91^{6}	48	94^{7}	48	95^{8}	24	92^{9}	24	90^{10}	26	92^{11}	28	92^{12}	24	....	....	91	341
4	13- 4	....	....	....	....	....	....	....	....	83^{8}	27	85^{9}	19	78^{10}	25	74^{11}	20	74^{12}	20	....	....	....	....	....	....	79	111
5	10- 1	....	....	92^{4}	42	94^{5}	40	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	93	82
6	11- 3	....	....	....	....	73^{4}	29	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	73	29
7	8- 6	94^{3}	46	76^{4}	40	79^{5}	40	82^{6}	44	78^{7}	48	....	....	....	....	....	....	....	....	....	....	....	....	....	....	82	218
8	12- 4	....	....	....	....	....	....	89^{6}	47	89^{7}	45	84^{8}	20	83^{9}	20	82^{10}	24	80^{11}	22	78^{12}	24	....	....	....	....	84	202
9	9- 6	....	....	89^{3}	38	86^{4}	33	80^{5}	48	88^{6}	46	....	....	78^{8}	20	77^{9}	23	....	....	....	....	....	....	....	....	83	208
10	8-10	91^{3}	32	90^{4}	43	91^{5}	46	89^{6}	45	83^{7}	48	82^{8}	23	85^{9}	22	86^{10}	19	....	....	....	....	....	....	....	....	86	278
11	13- 0	....	....	....	....	....	....	....	....	89^{8}	44	82^{9}	28	80^{10}	18	78^{11}	28	75^{12}	19	....	....	....	....	....	....	81	137
12	8-11	92^{3}	44	91^{4}	47	86^{5}	48	88^{6}	45	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	89	184

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[1] The table for Chart Ic may be found on page 74.

TABLE 24.—*Marks and grades*—Continued.

AVERAGE MARK, GRADE, AGE, AND NUMBER OF CASES—HORACE MANN SCHOOL GIRLS—Continued.

FOR CHART VIc.

No. of curve.	Age in years and months.	Age in years.																								General average.	Total cases.
		9		10		11		12		13		14		15		16		17		18		19		20			
		Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.		
1																											
2	14– 0											95^{8}	36	88^{9}	28	91^{10}	20	86^{11}	25	89^{12}	20	92^{12}	20			90	149
3	9– 0	94^{3}	38	91^{4}	33	86^{5}	44	91^{6}	47	88^{7}	29	91^{8}	21	89^{9}	26											90	238
4	9– 5	93^{3}	38	92^{4}	36	91^{6}	44	86^{7}	44	88^{8}	24	85^{9}	23	83^{10}	24	83^{11}	28	82^{12}	24							85	285
5	12– 1							91^{5}	47	91^{6}	40	86^{8}	20	81^{9}	20	76^{10}	25	84^{11}	16	81^{12}	19					84	187
6	8– 7	93^{3}	33	96^{4}	38	96^{5}	44	96^{6}	48	97^{7}	48	93^{9}	20	96^{10}	24	96^{11}	24									95	279
7	11– 4					82^{4}	38	84^{5}	44	88^{6}	45	86^{7}	42	75^{8}	16	78^{9}	20									82	203
8	8–10	88^{3}	38	89^{4}	36	86^{5}	44	87^{6}	40	87^{7}	48	88^{8}	20	78^{9}	20	78^{10}	24	79^{11}	15	82^{12}	22					84	307
9	10–10					94^{4}	32	89^{6}	43	94^{7}	44	92^{8}	24	83^{9}	24	90^{10}	28	88^{11}	32	87^{12}	24					90	241
10	9– 8			79^{3}	32	84^{4}	37	82^{5}	47	89^{6}	48	82^{7}	48													83	212
11	9– 5	89^{3}	16	70^{4}	36	81^{5}	44	89^{6}	48	93^{7}	42	82^{8}	20													84	206
12	9– 1	82^{3}	8	72^{4}	40	80^{5}	44	87^{6}	43	83^{7}	43															81	178
13	16– 5															85^{10}	16	83^{11}	16	80^{12}	20					83	52

FOR CHART VIIc.

No. of curve.	Age in years and months.	9 Average mark.	9 Cases.	10 Average mark.	10 Cases.	11 Average mark.	11 Cases.	12 Average mark.	12 Cases.	13 Average mark.	13 Cases.	14 Average mark.	14 Cases.	15 Average mark.	15 Cases.	16 Average mark.	16 Cases.	17 Average mark.	17 Cases.	18 Average mark.	18 Cases.	19 Average mark.	19 Cases.	20 Average mark.	20 Cases.	General average.	Total cases.
1	12– 0							88^{6}	44	91^{7}	48	86^{8}	20	83^{9}	15	86^{10}	20	86^{11}	20	85^{12}	20					86	187
2	11– 6							93^{5}	44	90^{6}	40	92^{7}	48	88^{8}	16	85^{9}	20	90^{10}	20							90	188
3	10– 6					86^{5}	48	93^{6}	40	92^{7}	48	92^{8}	24	93^{9}	16	91^{10}	22	95^{11}	20	95^{12}	22					92	240
4	11– 8							92^{3}	40	91^{4}	33	84^{5}	44	89^{6}	48	85^{7}	44	77^{8}	22	82^{9}	20					86	251
5	11– 1					88^{3}	38	84^{4}	34	83^{5}	47	82^{6}	48	79^{7}	48	75^{8}	20	78^{9}	20	68^{10}	18					80	273
6	9– 6			91^{3}	36	89^{4}	34	88^{5}	47	91^{6}	36	92^{7}	47	90^{8}	24	83^{9}	26	77^{10}	24	74^{11}	24					86	298
7	11– 3					83^{4}	36	88^{5}	44	92^{6}	40	91^{7}	48	86^{8}	20	85^{9}	19	87^{10}	22	81^{11}	20	83^{12}	24			86	273
8	10–10					94^{3}	38	91^{4}	36	85^{6}	44	87^{7}	47													89	165
9	9– 6			89^{3}	38	89^{4}	36	89^{5}	44	92^{6}	40	84^{7}	48	80^{8}	20	80^{9}	20	81^{10}	21	83^{11}	19	81^{12}	16			85	302
10	10– 6					84^{4}	23	78^{5}	47	88^{6}	47	82^{7}	47	77^{8}	20	76^{9}	22	76^{10}	24	73^{11}	21					79	251
11	10–11					92^{3}	40	86^{4}	33	87^{5}	39	89^{6}	44	86^{7}	47	88^{8}	20	83^{9}	16	80^{10}	24	78^{11}	24	79^{12}	20	85	307

AVERAGE MARK, GRADE, AGE, AND NUMBER OF CASES—FRANCIS W. PARKER SCHOOL BOYS.

FOR CHART VIIIc.

No. of curve.	Age in years and months.	Age in years.																									General average.	Total cases.
		7		8		9		10		11		12		13		14		15		16		17		18		19			
		Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.		
1	6–7	73^{1}	8	73^{2}	8	73^{3}	8	73^{4}	8	79^{5}	8	79^{6}	8	79^{7}	8	79^{8}	8											76	64
2	8–8					79^{4}	8	79^{5}	8	80^{6}	8	80^{7}	8	80^{8}	8	79^{9}	8											80	48
3	6–11	86^{1}	7	86^{2}	7	86^{3}	8	86^{4}	8	86^{5}	8	86^{6}	8	86^{7}	8													86	54
4	12–0											71^{6}	8	71^{7}	8	71^{8}	8	72^{9}	9	72^{10}	9	72^{11}	9	72^{12}	9			72	60
5	6–10	85^{1}	7	85^{2}	7	85^{3}	7	85^{4}	7	86^{6}	8	86^{6}	8	86^{7}	8	86^{8}	8	88^{9}	8									86	68
6	9–10							58^{2}	6	61^{3}	8	61^{4}	8	61^{5}	8	78^{6}	8	78^{7}	8	78^{8}	8	78^{9}	6	78^{10}	8			70	68
7	7–11			75^{1}	7	75^{2}	7	75^{3}	8	76^{4}	8	78^{5}	8	78^{6}	8	78^{7}	8	78^{8}	8	78^{9}	8							77	70
8	12–0											79^{6}	8	79^{7}	8	79^{8}	8	80^{9}	8	80^{10}	8	80^{11}	8	80^{12}	8			80	56
9	11–0									83^{5}	8	83^{6}	8	83^{7}	8	83^{8}	8	85^{9}	9	85^{10}	9	85^{11}	9	85^{12}	9			84	68
10	11–3									67^{2}	8	67^{3}	8	67^{4}	8	67^{5}	8	67^{6}	8	67^{7}	8	67^{8}	8	67^{9}	8			67	64
11	12–5											76^{6}	8	76^{7}	8	76^{8}	8	76^{9}	8	76^{10}	8	76^{11}	8					76	48
12	7–0	59^{1}	8	59^{2}	8	59^{3}	8	59^{4}	8	59^{5}	8	59^{6}	8															59	48

FOR CHART IXc.

No. of curve.	Age in years and months.	7		8		9		10		11		12		13		14		15		16		17		18		19		General average.	Total cases.
		Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.		
1	6–7	80^{1}	8	80^{2}	8	80^{3}	8	80^{4}	8	81^{5}	8	81^{6}	8	81^{7}	8	81^{8}	8	80^{9}	8									80	72
2	6–6	61^{2}	7	61^{3}	7	66^{4}	7	66^{5}	7	66^{6}	7	66^{7}	7	69^{8}	8													65	50
3	12–11													85^{7}	8	86^{8}	8	85^{9}	9	85^{10}	9	85^{11}	9	85^{12}	9			85	52
4	10–8									89^{6}	8	89^{7}	8	89^{8}	8	91^{9}	9	91^{10}	9	91^{11}	9	91^{12}	9					90	60
5	12–0											79^{6}	9	79^{7}	9	79^{8}	9	81^{9}	9	81^{10}	9	81^{11}	9					80	54
6	8–0			83^{3}	8	83^{4}	8	83^{5}	8	83^{6}	8	83^{7}	8	84^{8}	8	83^{9}	9	83^{10}	9									83	66
7	11–2									84^{5}	8	84^{6}	8	85^{7}	8	85^{8}	8	86^{9}	9	86^{10}	9	86^{11}	9	86^{12}	9			85	68
8	7–0	66^{1}	8	66^{2}	8	66^{3}	8	66^{4}	8	68^{5}	8	68^{6}	8	68^{7}	8	68^{8}	8											67	64
9	11–7											79^{5}	8	79^{6}	8	79^{7}	8	80^{8}	8	79^{9}	9	79^{10}	9	79^{11}	9	79^{12}	9	79	68
10	10–10									66^{4}	6	66^{5}	6	66^{6}	6	66^{7}	6	66^{8}	6	66^{9}	6							66	36
11	10–1							81^{4}	8	81^{5}	8	83^{6}	8	84^{7}	8	83^{8}	8	84^{9}	9	84^{10}	9	84^{11}	9	84^{12}	9			83	76
12	6–9½	79^{1}	8	79^{2}	8	79^{3}	8	79^{4}	8	81^{5}	8	81^{6}	8	81^{7}	8	81^{8}	8	79^{9}	7									80	71
13	10–0							80^{3}	8	80^{4}	8	81^{5}	8	81^{6}	8	81^{7}	8	83^{8}	8	82^{9}	9	82^{10}	9	82^{11}	9	82^{12}	9	81	84
14	7–7			68^{1}	8	68^{2}	8	68^{3}	8	68^{4}	8	68^{5}	8	68^{6}	8	68^{7}	8	68^{8}	8									68	64

TABLE 24.—*Marks and grades*—Continued.

AVERAGE MARK, GRADE, AGE, AND NUMBER OF CASES—FRANCIS W. PARKER SCHOOL GIRLS.

FOR CHART Xc.

No. of curve.	Age in years and months.	Age in years.																										General average.	Total cases.
		7		8		9		10		11		12		13		14		15		16		17		18		19			
		Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.	Average mark.	Cases.		
1	7- 7			88^{1}	8	88^{2}	8	88^{3}	8	88^{4}	8	88^{5}	8	88^{6}	8	88^{7}	8											88	56
2	10-10									79^{6}	8	79^{6}	8	79^{7}	8	79^{8}	8	76^{9}	9	76^{10}	9	81^{11}	9	81^{12}	9			79	68
3	7-11			84^{2}	8	84^{3}	8	84^{4}	8	84^{5}	8	84^{6}	8	84^{7}	8	84^{8}	8											84	56
4	10- 8									83^{4}	8	83^{5}	8	83^{6}	8	84^{7}	8	84^{8}	8	84^{9}	9	84^{10}	9					84	58
5	14- 0															85^{8}	8	85^{9}	9	91^{10}	9	92^{11}	9	93^{12}	9			89	44
6	9- 8							82^{4}	7	82^{5}	7	82^{6}	7	82^{7}	7	82^{8}	7	82^{9}	7	82^{10}	7	83^{11}	8					82	57
6a	11- 2									73^{5}	5	73^{6}	5	73^{7}	5	73^{8}	5	75^{9}	6	75^{10}	6	75^{11}	6	75^{12}	9			74	47
7	6- 8	81^{1}	7	81^{2}	7	80^{3}	8	80^{4}	8	80^{5}	8	80^{6}	8	80^{7}	8	80^{8}	8	79^{9}	8	79^{10}	9							80	80
8	6- 7	85^{1}	8	85^{2}	8	85^{3}	8	88^{4}	8	88^{5}	8	88^{6}	8	88^{7}	8													87	56
9	8- 7					85^{2}	8	85^{3}	8	85^{4}	8	85^{5}	8	94^{6}	8	94^{7}	8	94^{8}	8	93^{9}	9	93^{10}	9					89	74
10	10- 5							81^{4}	8	81^{5}	8	81^{6}	8	81^{7}	8	81^{8}	8	81^{9}	9	81^{10}	9	81^{11}	9	81^{12}	9			81	76
11	7- 0	85^{1}	8	85^{2}	8	85^{3}	8	85^{4}	8	86^{5}	8	86^{6}	8	85^{7}	8	85^{8}	8	84^{9}	8									85	72
12	11- 8											73^{5}	8	73^{6}	8	73^{7}	8	73^{8}	8	73^{9}	8	73^{10}	8	73^{11}	8	73^{12}	8	73	64

FOR CHART XIc.

No. of curve.	Age in years and months.	7 Average mark.	7 Cases.	8 Average mark.	8 Cases.	9 Average mark.	9 Cases.	10 Average mark.	10 Cases.	11 Average mark.	11 Cases.	12 Average mark.	12 Cases.	13 Average mark.	13 Cases.	14 Average mark.	14 Cases.	15 Average mark.	15 Cases.	16 Average mark.	16 Cases.	17 Average mark.	17 Cases.	18 Average mark.	18 Cases.	19 Average mark.	19 Cases.	General average.	Total cases.
1	6- 9	85^{1}	8	85^{1}	8	85^{3}	8	85^{4}	8	85^{5}	8	85^{6}	8	85^{7}	8	79^{8}	8	77^{9}	9	83^{10}	9							83	82
2	10- 8									66^{4}	8	66^{5}	8	66^{6}	8	66^{7}	8	79^{8}	8	79^{9}	8	79^{10}	8	79^{11}	8	79^{12}	8	73	72
3	8- 7			81^{3}	8	81^{4}	8	81^{5}	8	80^{6}	8	75^{7}	8	76^{8}	8	81^{9}	9	71^{10}	9									78	66
4	8- 3			85^{3}	8	85^{4}	8	85^{5}	8	86^{6}	8	88^{7}	8	90^{8}	8	91^{9}	8											87	56
5	10- 9									78^{4}	8	78^{5}	8	78^{6}	8	78^{7}	8	78^{8}	8	78^{9}	8	78^{10}	8	78^{11}	8	78^{12}	8	78	72
6	10- 5							84^{5}	8	84^{6}	8	84^{7}	8	84^{8}	8	84^{9}	7											84	39
7	11- 1									76^{4}	8	76^{5}	8	76^{6}	8	76^{7}	8	76^{8}	8	76^{9}	9	76^{10}	9	77^{11}	9	77^{12}	9	76	76
8	10- 1							86^{5}	8	86^{6}	8	86^{7}	8	86^{8}	8	86^{9}	8	86^{10}	8	86^{11}	8							86	56
9	9-10							84^{5}	9	84^{6}	9	84^{7}	9	84^{8}	9	84^{9}	10	84^{10}	10	84^{11}	10							84	66

(E) INDIVIDUAL NOTES ON SCHOOL PROGRESS.[1]

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart IIc.

1. Still in school.
2. Have marks for one year only.
3. Took part work during third grade; absent second term of fourth because of whooping cough; still in school.
4. Left at beginning of eleventh grade.
5. Part work in eighth grade; absent fourth term of eighth, first and second terms of ninth; graduated.
6. Regular work; conditioned in French during eighth grade; in Latin during eleventh; graduated.
7. Part work in third grade; withdrew at end of seventh.
8. In third grade.
9. In third grade.
10. Regular work; conditioned in French during seventh grade; in Latin during eighth; in English, Latin, and history during ninth; in German during eleventh; still in school.
11. Ill during fourth term of third grade; repeated grade following year; absent during second and third terms of eighth; still in school.
12. In school; skipped fourth grade.
13. Conditioned in French during eighth grade; in Latin during ninth, tenth, and eleventh.
14. Left school at beginning of fourth grade.
15. Skipped seventh grade; conditioned in Latin during eighth; in Latin and algebra during eleventh; graduated.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart IIIc.

1. Part work in third grade; still in school.
2. Conditioned in arithmetic during third grade; in history, geography, German during seventh; in Latin and algebra during eighth; withdrew.
3. Absent during second, third, and fourth terms of eighth grade; conditioned in Latin during ninth; not promoted; withdrew.
4. Conditioned in Latin during ninth grade; in school.
5. Absent during fourth term of fifth grade; conditioned in English and French during eighth; part work in ninth; withdrew.
6. Normal work.
7. Normal work; graduated.
8. Conditioned in English and biology during eighth grade; in Latin and history during ninth; in Latin and algebra during tenth; withdrew.
9. Out of school during fourth term of eighth grade and third term of ninth.
10. Failed to be promoted at end of fifth grade; in school.
11. Absent fourth term of fifth grade; conditioned in arithmetic during sixth; in English and algebra during eighth; withdrew.
12. Poor work in lower grades but improved; conditioned in history during ninth grade; in English, Latin, algebra, geometry, physics during tenth; withdrew.
13. Repeated third grade; conditioned in English and history during fifth.
14. Withdrew from school for one year between fifth and sixth grades; conditioned in algebra during ninth; in geometry during tenth; chemistry during eleventh; graduated.
15. Promoted conditionally from fourth grade; conditioned in French during seventh grade; in algebra during eighth; withdrew.

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[1] The notes for Chart Ic may be found on page 76.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart IVc.

1. Conditioned during tenth grade; graduated.
2. Graduated.
3. Conditioned in algebra during ninth grade.
4. Part work in third grade; skipped fifth; in school.
5. Part work in third grade; absent third term of fourth, whooping cough; in school.
6. Conditioned in algebra during eighth grade; in history during tenth; in school.
7. No record for sixth grade; conditioned in history and arithmetic during seventh; in Latin and history during ninth; in school.
8. Conditioned in algebra during ninth grade.
9. In school.
10. Conditioned in history and geometry during eleventh grade, on account of absence; graduated.
11. In sixth grade two years with good records; frequently absent in eighth; in school.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart Vc.

1. Withdrew at end of second term of fourth grade; returned in fifth; in school.
2. Normal work.
3. Large number of subjects and high grades.
4. Conditioned in Latin during eleventh grade; graduated.
5. Two years' records; in school.
6. One year's records; absent during fourth term; withdrew.
7. Normal work.
8. Normal work; graduated.
9. No record for eighth grade; conditioned in algebra during tenth.
10. Normal work; in school.
11. Conditioned in Latin and history during eighth grade; in Latin and Greek during ninth; graduated.
12. Normal work; left school.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart VIc.

1. Record not available.
2. Normal work; graduated.
3. Normal work; in school.
4. Conditioned in biology during eighth grade; graduated.
5. Conditioned in Latin during ninth grade; graduated.
6. Excellent record; in school.
7. Conditioned in Latin during ninth grade; in school.
8. Conditioned in Latin, history, German, during ninth grade; in algebra during tenth; graduated.
9. Normal work; graduated.
10. In school.
11. Part work in third grade; conditioned in arithmetic during fourth; in school.
12. Part work in third grade; withdrew end of second term, returned in fall; in school.
13. Normal work; graduated.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart VIIc.

1. Normal work; graduated.
2. No record after tenth grade.
3. *Normal work; graduated.*

4. Conditioned in French during seventh and eighth grades.
5. Conditioned in geography and German during seventh grade; in Latin during eighth; in French during ninth; in Latin, history, geometry during tenth.
6. Conditioned in algebra during ninth grade; in Latin during eleventh; in school.
7. Normal work; graduated.
8. Normal work; graduated.
9. Normal work; graduated.
10. Lazy; in school.
11. Conditioned in Latin during eleventh grade; graduated.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart VIIIc.

1. Poor in French from third grade.
2. Entered fourth grade.
3. Entered kindergarten.
4. Entered sixth grade; conditioned annually in spelling; graduated.
5. Entered first grade; normal work.
6. Entered second grade; poor in German after fourth; poor in spelling.
7. Entered kindergarten; poor in spelling throughout course.
8. Entered sixth grade; normal work; graduated.
9. Entered fifth grade; normal work; graduated.
10. Poor in spelling and mathematics throughout course.
11. Entered sixth grade; normal work.
12. Entered kindergarten; poor in English, German, reading, spelling.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart IXc.

1. Normal work.
2. Entered second grade; poor in English and spelling.
3. Entered seventh grade; normal work.
4. Entered sixth grade; graduated; normal work.
5. Entered sixth grade; normal work.
6. Entered third grade; normal work; graduated.
7. Entered fifth grade; normal work; graduated.
8. Entered kindergarten; poor in spelling and reading.
9. Entered fifth grade; normal work; graduated.
10. Entered fourth grade; poor in English.
11. Entered fourth grade; normal work; graduated.
12. Entered first grade; normal work.
13. Entered third grade; normal work.
14. Entered first grade; poor in spelling and mathematics.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart Xc.

1. Normal work.
2. Entered fifth grade; normal work; graduated.
3. Entered second grade; normal work.
4. Entered fourth grade; normal work.
5. Normal work; graduated.
6. Normal work.
7. Entered first grade; normal work.
8. Entered first grade; normal work.
9. Entered second grade; normal work.
10. Normal work; graduated.
11. Entered kindergarten; normal work.
12. Poor in spelling.

Notes on the school standing of individuals whose marks and grades appear in Table 24 and Chart XIc.

1. Normal work.
2. Normal work.
3. Normal work; withdrew at tenth grade.
4. Normal work.
5. Normal work; graduated.
6. Normal work.
7. Normal work; graduated.
8. Normal work; withdrawn at end of eleventh grade.
9. Normal work; withdrawn at end of eleventh grade.

Notes on the school standing of individuals whose marks and grades appear in Table 24.

1. Conditioned in spelling and handwork regularly.
2. Normal work; withdrawn at end of eleventh grade.
3. Poor in French and spelling; in school.
4. Entered kindergarten; died in seventh grade.
5. Entered kindergarten; normal work; withdrew at end of sixth grade.
6. Poor health, poor work; in school.
7. Entered first grade; normal work.
8. Entered kindergarten; poor in spelling and mathematics.
10. Entered second grade; normal work; graduated.

IV. HISTORICAL SUMMARY.

(A) THE RISE OF PHYSICAL MEASUREMENTS.

Scientific anthropometry arose in the main from the artists' desire to find the best proportions for the beautiful forms which they wished to represent. For example, Phidias, it has been said, used 20 models in order that he might assemble the most beautiful parts of each into one figure. As early as 1770 Sir Joshua Reynolds called attention, in an address delivered before the Royal Academy of Fine Arts, to the differences in the measurements of the human form from childhood to adult life. But it was to M. Quetelet, who coined the word anthropometry, that credit should be given for the first scientific study of physical growth, since his work was pursued from the standpoints of art and the scientific method of empirical measurements and induction in 1836. Quetelet's data were meager, and he failed to discover what has since been verified by all investigators, that girls are taller and heavier than boys during the early adolescent period.

The vast amount of work that has been done in the field of experimental measurements and physical tests consists largely of tabulated and descriptive reports in a wide range of disconnected fields of endeavor. Much of the work is only suggestive and will have to be done again under standardized conditions in order to determine definite correlations. One of the most varying factors is that of age, since many investigators use the last birthday, others the nearest birthday, some the next birthday, others the age between the past and future birthdays, and still others try to calculate exact birthdays. In not a single case, as far as I have been able to determine, have the measurements been taken on the birthday except by chance. Many investigators measure the children with their clothing on, and no calculations are accurate which aim to give the height of the shoe heel or the weight of the clothes. Again, many of the measurements are made, in a number of investigations, by amateurs; it is very difficult to get the measurements of trained anthropometrists to agree.

In spite of the heterogeneous material on hundreds of thousands of children which has been collected, much valuable and painstaking work has been done which will be of direct scientific significance and of direct assistance to the physical director, the physician, the hygienist, anthropologist, educational psychologist, and educator. It is hoped that this monograph will not only make a distinctly new contribution to the important field of scientific and experimental education, but that it will assist in making more accessible the work previously done.

The first important investigation on the physical measurements of adolescent boys that I have been able to find was published in 1854 by Zeissing in his study of Belgian children. Following this, in 1860, Cromwell studied the growth of Manchester school children for the ages from 8 to 18, and discovered the general law which has been verified by every authority since that date with the exception of Quetelet for normal children and Goddard for feeble-minded children, i. e., *girls are taller and heavier than boys from the approximate ages of 11 to 14.* The boys then become taller and heavier and continue their growth longer.

The measurements of adolescent boys were published by G. C. Steet in 1874, in the form of a distribution table giving the relation of weight to height, which, so far as I can ascertain, is the first use of the *weight-height index* as an expression of the robustness of an individual. The first report was soon supplemented and improved by Roberts in 1876 and Bowditch in 1877. The following year, 1878, Roberts published his "Anthropometry," which gives in index columns, age columns, and result columns conclusions based on 27,640 males between the ages of 4 and 50 years from the records of Dr. Bowditch, of Boston, Mass., and later gives a table showing the comparative measurements of 59,077 males, including 11 classes of individuals. In 1883 the final report of the anthropometric committee, of which Francis Galton was chairman, was drawn up and submitted by Roberts and Sir R. W. Rawson. In England the study of growth has been mainly by men who were interested in the general laws of

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anthropology, while in America the work was originally pursued for its educational value and more recently for its correlation in psychological studies.

Following Quetelet's study of the individuals for each age from birth to 21 years, Bowditch made in 1875 his extensive investigation on over 24,000 Boston school children; during the same year the Provost General of the United States published the statistics of the American armies comprising 190,621 male whites ranging from 16 to 42 years of age. In 1878 Roberts began to publish his tables on over 30,000 individuals of all classes in England, which were followed by the Report of the Anthropometric Committee on Schools, Military and Naval Colleges, based on 29,405 males and females. The following year Peckham began his investigations in America and Hertel in Denmark. The subsequent investigations of the more general type were Key's, in Sweden in 1889, where 18,000 children were measured; Geisslers's, in Germany, where the records from 21,173 children were used; and Porter's, in America, in 1893, where 21,173 children were studied in relation to physical growth and mental development. Since this date more detailed work has been done with special ages, nationalities, sexes, and classes.

Roberts began the work of differentiating the classes and found the children of the favored classes were taller and heavier than those of the artisan classes; this view has been substantiated by practically all other authorities who have made such distinctions in the data. In addition to the numerous special groups of children measured, the most valuable individual study is that of Wiener's four sons from birth to 20 years of age. Among the other individual studies are Camerer's, Peckham's, King's, Landsberger's, and Wissler's which is especially valuable.

The first study dealing with feeble-minded children as a class was made by Roberts in 1878 on about 130 children. The second significant report was made by Tarbell in 1881; a third by Shuttleworth in 1884 on 1,209 children, followed by Wylie's in 1889 and 1903 on about 400 children. Goddard's investigation covering over 10,000 cases is the most painstaking and valuable in this field.

(B) SOME GENERAL CONCLUSIONS.

1. HEIGHT.

Periods of growth.—First-born children exceed later-born children in height (Boas). Short children continue longer to grow than tall children (Boas).

The most rapid growth occurs during the first year, and the rate is approximately the same for boys and girls (Burk).

The period of accelerated growth appears just before puberty and the most rapid adolescent growth is from 14 to 15 (Hall).

Large children have the period of accelerated growth in height earlier than short children (Bowditch). This conclusion is not upheld by Boas.

The comparative rate of growth in height of dull, mediocre, and precocious children of the same sex is the same at all ages from 7 to 16, inclusive (Porter).

There is a close correlation between height and pubertal maturation, as shown by pubescence (Crampton, Weissenberg, Foster).

Manner of growth.—Growth in height is rhythmic, alternating periods of growth with periods of inactivity (Hall, Burk).

The body does not grow relatively larger but by parts (Vierordt).

The body normally increases from birth to maturity 3 times in height (Hall).

Children have each year a maximal, a middle, and a minimal period of growth; in the maximal period the daily growth is 2½ times as much as in the middle period, while the middle period is 2 times as great as the minimum (Malling-Hansen).

The fluctuations in the growth of a youth, a boy, and an infant are relatively the same (Camerer).

Physical and mental development.—Dull children are shorter than precocious children of the same age or average children (Porter, Christopher).

Early pubescence favors good scholarship; late pubescence, poor scholarship (Crampton).

There is no correlation between academic examinations in college and physical measurements (Galton).

Successful pupils are taller than unsuccessful, and the rate of growth is quicker than in the successful (Gratsianoff).

Sex.—Boys are taller than girls at all ages except the period from about 11 to 14, when girls excel in both height and weight (Smedley).

Growth is more variable with girls than with boys (Boas).

The relation of weight and height in growing children is such that at heights below 58 inches boys are heavier than girls in proportion to their stature. At heights above 58 inches the reverse is true (Bowditch).

Girls nearly cease to grow at about 17 years of age (Peckham). This view is substantiated by practically all investigators.

Boys cease growing at about 23 years of age (Sargent, Seaver). There is occasionally a decrease in height after 23. Gould found that the total height of men was not attained until the age of 27.

From 15 to 18 sitting height in girls increases only 2 inches, but over 4 inches in boys. At 14 the lower extremities of girls almost cease to grow, while those of boys increase 4 inches between 14 and 19 (MacDonald).

Heredity.—The fact that we have certain particular men and women for our ancestors determines to a large extent what particular height we shall have (Thorndike).

Environment.—Height is conditioned to some extent by the nutrition of the body, by exercise, by disease, in short, by all agents that influence bodily functions in general (Thorndike, Hrdlicka, Burk).

The height of American-born men is modified by the density of population. Urban life decreases stature from 5 years on (Peckham).

Country boys are taller than city boys (Galton).

There is apparently an influence of climate upon growth in height (Baxter).

Social or environmental conditions may influence the rate of growth at different stages of development (Meumann).

It is possible that the late period of growth is inhibited by improper hygienic conditions more than earlier periods (Hall).

Disease.—Accelerated growth and better resistance of disease go together (Key).

The age of greatest growth, the adolescent period, is the age of greatest vitality and fewest deaths (Hartwell).

There is 5 to 10 per cent less sickness among boys than girls (Schmidt-Monnard).

Arrest of growth frequently precedes disease in childhood and should be considered a danger signal (Boulton).

Classes.—Children of the favored or nonlaboring class are taller than those of the working class or less favored (Bowditch, Roberts, Geissler, Baxter). Boudin does not hold this theory. This difference is especially noticeable in the girls of the two classes (Pagliania).

The pubertal period of superiority of girls in height and sitting height is nearly a year longer in the laboring classes than in the nonlaboring classes, and the children of the latter show more ability in their studies than the former (MacDonald, Roberts).

Children under poor nutritive conditions grow as fast or faster from 6 to 17 years of age, but they are shorter before that time than the well-nourished child, and hence never attain to equal height (Bowditch, Burk).

College students have increased in height during the past 25 years (Sargent).

Nationality.—Children of American-born parents are in this country taller than children of foreign-born parents (Bowditch, Peckham).

Race seems to be more important than social or environmental conditions in determining absolute growth, but the latter conditions may influence the rate of growth at different stages of development *(Meumann)*.

American children are taller than European children; Americans are taller than Europeans (Dickson).

Children and adults in the different parts of the United States vary in height (Barnes, Baxter, Gould, Dickson).

White children not only have a greater standing height than colored children, but their sitting height is still greater (MacDonald, Greenwood).

Children of Irish parents are taller than those of German parentage; variations are due to stock or race (Peckham).

In intermarriage between the Germans and the Americans the tendency is to take the height of the taller parent (Peckham).

American boys excel in height only during pubescent years; later they are overtaken in height by Swedish, Danish, and Dutch (Hall).

Filipino children show less sex variations in height than Americans (Bobbitt).

Chinese children are shorter than the average European (Bobbitt, Misawa).

Abnormal.—Children with abnormalities are inferior in height to children of normal growth (MacDonald).

Feeble-minded are, as a rule, shorter than the normal child, and the lower the grade the greater the divergence (Goddard).

The decrease in height is marked in defective children after 18 years of age (Goddard).

The average height of the feeble-minded approximates the minimum of the normal (Wylie, Goddard).

Delinquent girls are as tall as the average girl (Tallant).

2. WEIGHT.

Periods of growth.—First-born children exceed later-born children in weight (Boas).

Large children have the period of accelerated growth in weight earlier than short children (Bowditch).

The comparative weight growth of dull, mediocre, and precocious children is the same at all ages from 7 to 16 inclusive (Porter).

There is a close correlation between weight and pubertal maturation as shown by pubescence (Crampton, Weissenberg, Foster).

Manner of growth.—Growth is rhythmic, alternating periods of weight growth with periods of inactivity (Hall, Burk).

The body normally increases from birth to maturity 20 times in weight (Hall).

Children increase in weight by day and decrease by night (Malling-Hansen).

The fluctuations in the growth of a youth, a boy, and an infant are relatively the same (Camerer).

The physical and mental development.—Dull children are lighter tha precocious children (Porter, Christopher).

The acceleration in weight preceding puberty takes place at th same age in dull, mediocre, and precocious children (Porter).

There is no correlation between academic examinations in colleg and physical measurements (Galton).

Successful pupils are larger than unsuccessful, and the rate growth is quicker in the successful (Gratsianoff).

Sex.—Boys are heavier than girls at all ages, except the period fro about 11 to 14, when girls excel in weight (Smedley).

Boys now are slightly lighter than in 1876 and girls are heavi (Harrington).

Environment.—Weight is conditioned by the nutrition of the bod by exercise, by disease, in short, by all agents that influence bodil functions in general (Thorndike, Hrdlicka, Burk).

Country boys are heavier than city boys (Galton).

Accelerated growth and better resistance of disease go togeth (Key).

Loss of weight frequently precedes disease in childhood and shoul be considered a danger signal (Boulton).

Classes.—Children of the favored classes are heavier than childre of the working class (Bowditch, Roberts).

Boys of the favored class in America are heavier than the same cla in England (Bowditch).

The pubertal period of superiority of girls in weight is nearly a ye longer in the laboring class than in the nonlaboring class (MacDonald

College students have increased in weight in the last 25 years (Sa gent).

Agricultural students in college are heavier than those of oth classes (Elson).

Nationality.—Children of American-born parents are in this coun try heavier than children of foreign-born parents (Bowditch, Pec ham).

The average American is heavier than the average Europea (Dickson).

Children and adults vary in weight in different parts of the Unite States (Barnes, Baxter, Gould, Dickson).

Colored children have a greater weight in proportion than whit children (MacDonald, Greenwood).

Filipino children show less sex variation in weight than American (Bobbitt).

Chinese children are lighter than the average European (Misaw Bobbitt).

Europeans increase more in weight than Americans (Dickson).

Abnormal.—Defectives are heavier at birth than normal children (Wylie, Goddard).

Children with abnormalities are lighter than normal children (MacDonald).

Feeble-minded children are lighter than normal children, and the lower the mental grade the greater the divergence from the normal (Goddard).

Delinquent and truant boys are, as a rule, lighter than boys in the public school (Smedley).

Delinquent girls from a rural reformatory school are as heavy as the average child (Tallant).

3. LUNG CAPACITY.

Growth.—Lungs share to a marked degree in the augmented development of adolescence (Hall).

Lungs continue to grow in weight until old age; in youth they constitute from 1½ to 2 per cent of body weight, in maturity from 2½ to 3½ (Hall).

The maximal capacity is at 19, according to Beyer, while other authorities place it at 35.

The greatest lung capacity occurs in the child naturally after the year of greatest aggregate increase (Hall).

For each centimeter of increase or decrease of stature above or below the mean, there is a corresponding rise or fall of the vital capacity, amounting in men to 60 cubic centimeters, in women to 40 cubic centimeters (Whipple).

Weight increases more than vital capacity, while vital capacity increases more than height (Kottelman, MacDonald).

Physical exercise may increase vital capacity somewhat; tight clothing, disease, and other unfavorable factors will decrease it (Whipple).

Sex.—Girls increase most rapidly in vital capacity from 12 to 14, after which the increment is at a diminished rate, and apparently ceases to increase altogether at 20 (Smedley).

Boys take a sudden start upward at 14, and continue a rapid rise until at least 19½ (Smedley).

Boys have a larger vital capacity than girls at all ages (all investigators).

Mental.—The lung capacity was found to be much greater in children whose standing in school was high and distinctly inferior in a school for laggards (Smedley).

Vital capacity of feeble-minded children is below normal (Goddard), as is also that of retarded children (De Busk)

The most complete and significant table of growth so far published for general purposes is that by Burk, based on [illegible] data for height, and data from Bowditch, Peckham, and Porter for weight. These tables are as follows:

(C) NORMS.

TABLE 25.—*Average American height mathematically calculated by Dr. Franz Boas from the data of 45,151 boys and 43,298 girls in the cities of Boston, St. Louis, Milwaukee, Worcester, Toronto, and Oakland (Cal.); also absolute and percentage annual increases of same.*

Approximate average age.	Boys.				Girls.			
	Number of observations.	Average for each year.	Absolute annual increase.	Annual increase.	Number of observations.	Average for each year.	Absolute annual increase.	Annual increase.
		Inches.	*Inches.*	*Per cent.*		*Inches.*	*Inches.*	*Per cent.*
5½	1,535	41.7	....	....	1,260	41.3	....	....
6½	3,975	43.9	2.2	5.3	3,618	43.3	2.0	4.8
7½	5,379	46.0	2.1	4.8	4,913	45.7	2.4	5.5
8½	5,633	48.8	2.8	6.1	5,289	47.7	2.0	4.4
9½	5,531	50.0	1.2	2.5	5,132	49.7	2.0	4.2
10½	5,151	51.9	1.9	3.8	4,827	51.7	2.0	4.0
11½	4,759	53.6	1.7	3.3	4,507	53.8	2.1	4.1
12½	4,205	55.4	1.8	3.4	4,187	56.1	2.3	4.3
13½	3,573	57.5	2.1	3.8	3,411	58.5	2.4	4.3
14½	2,518	60.0	2.5	4.3	2,537	60.4	1.9	3.2
15½	1,481	62.9	2.9	4.8	1,656	61.6	1.2	2.0
16½	753	64.9	2.0	3.2	1,171	62.2	.6	1.0
17½	429	66.5	1.6	2.5	790	62.7	.5	.8
18½	229	67.4	.9	1.4	....	....	....	....

Average American weight mathematically calculated from the data of about 68,000 children in the cities of Boston, St. Louis, and Milwaukee; also absolute and percentage annual increases of same.

Age.	Boys.			Girls.		
	Average for each age.	Absolute annual increase.	Annual increase.	Average for each age.	Absolute annual increase.	Annual increase.
	Pounds.	*Pounds.*	*Per cent.*	*Pounds.*	*Pounds.*	*Per cent.*
6½	45.2	....	....	43.4	....	....
7½	49.5	4.3	9.5	47.7	4.3	9.9
8½	54.5	5.0	10.1	52.5	4.8	10.0
9½	59.6	5.1	9.3	57.4	4.9	9.3
10½	65.4	5.8	9.7	62.9	5.5	9.6
11½	70.7	5.3	8.1	69.5	6.6	10.5
12½	76.9	6.2	8.7	78.7	9.2	13.2
13½	84.8	7.9	10.3	88.7	10.0	12.7
14½	95.2	10.4	12.3	98.3	9.6	11.9
15½	107.4	12.2	12.8	106.7	8.4	8.5
16½	121.0	13.6	12.7	112.3	5.6	5.2
17½	....	....	....	115.4	3.1	2.8
18½	....	....	....	114.9	....	....

Table 25 of Boas (see above) shows " the growths in height and weight and the annual absolute and proportional increases for what might be termed the average American boy and girl. The average in Table I (weight) has been calculated by the mathematician M. de Perott upon the following plan: The averages given by Bowditch from 24,500 children of Boston, by Porter from 34,500 children of St. Louis, and by Peckham from 9,600 children of Milwaukee—making nearly 69,000 children all together—have been thrown together, but not averaged directly. At each age the number of children has been massed from these three sources and each of the three averages allowed to influence the average of the whole in proportion to the number of children each city contributes. Thus, for example, suppose at the age of 10 years St. Louis contributes 5,000 children, Boston 4,000, and Milwaukee 1,000—altogether there would be 10,000 children of that age—the averages of the three cities would therefore influence the final average in the ratio of 5, 4, and 1, on the same principle we use in partnership."

A significant table bearing on the relation of mental development to growth was compiled and published by Porter. The table for weight is as follows:

TABLE 26.—*Relation of precocity to weight as indicated by distribution of heavy and light children of the same age in the different grades of St. Louis schools (after Porter).*

Age at nearest birthday.	Mean weight (boys, girls).	Grade.									
		Kindergarten.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	High school.
	Lbs.										
6	43.74	43.58	45.29								
	41.84	41.65	45.08								
7	47.73	45.58	48.48	52.00							
	45.84	43.87	46.76	49.88							
8	52.58	47.80	51.79	54.43	57.00						
	50.35	46.50	49.60	52.10	53.17						
9	57.75		55.87	57.64	59.66	61.75					
	55.17		52.57	55.44	57.18	60.00					
10	62.48		60.19	61.14	64.00	64.91					
	60.46		57.00	59.59	61.15	61.64					
11	68.47		63.50	65.45	68.12	69.24	71.29	73.34			
	65.64		66.34	62.95	65.50	66.77	68.12				
12	73.61		70.00	69.50	72.17	73.86	74.69	77.29	76.50		
	73.23		71.75	69.80	71.50	72.74	75.13	75.92	78.50		
13	79.85			74.25	75.95	78.43	80.90	82.17	83.50	82.00	
	83.73			79.50	76.50	81.92	82.78	86.95	87.63	88.50	
14	88.08				81.00	84.00	87.83	87.20	93.63	97.50	86.50
	93.94				90.50	87.17	92.67	94.64	96.15	99.00	103.12
15	100.20					89.00	95.33	99.17	105.50	105.17	105.08
	103.20					98.50	100.96	99.83	104.00	104.58	105.15
16	114.17							114.50	104.00	114.00	123.00
	110.06							108.12	107.38	110.29	113.57
17	115.69									111.00	116.00

"The truth which the table expresses is very plain. It declares in unmistakable lines that precocious children are heavier and dull children lighter than the mean child of the same age. It establishes a physical basis of precocity and dullness.

"Whether means or averages are the more trustworthy tools in investigations of this sort is a matter of opinion. So long as their respective value is a subject of controversy investigators will accept no results as final which can be supported only by means. It must therefore be my first concern to show that the law *mean precocity is related to mean physical development* may with equal truth be written *average precocity is related to average physical development.*"

The summaries given in the table following are included primarily for their historical suggestive value.

TABLE 27.—*Average height of men; 100 recruits from each State (Dickson, 1857).*[1]

	Feet.		Feet.
New York	5.6505	Ohio	5.7537
New Jersey and Delaware	5.6509	Indiana	5.7604
Pennsylvania	5.6756	Alabama	5.7647
Massachusetts and Connecticut	5.6821	Illinois	5.7696
Vermont and New Hampshire	5.6951	South Carolina	5.7729
Maryland	5.7130	Kentucky	5.7729
Missouri	5.7162	Tennessee	5.7779
Maine	5.7314	North Carolina	5.7814
Virginia	5.7488	Georgia	5.8272

Blond races are characterized by superior stature. The American Indian is a striking exception. Even though only 121 Indians were measured for this table, Gould finds, in an investigation of 517 Indians, a mean height of 68.225 inches.

TABLE 28.—*Height as affected by nationality.*

Order of superiority.	Nativity.	Number of men examined.	Mean height (inches).
1	United States, Indians	121	67.934
2	United States, whites	315,620	67.672
3	Norway	2,290	67.467
4	Scotland	3,476	67.066
5	British America	21,645	67.014
6	Sweden	1,190	66.896
7	Ireland	50,537	66.741
8	Denmark	383	66.648
9	Holland	989	66.637
10	Hungary	89	66.584
11	England	16,196	66.577
12	Germany	54,944	66.536
13	United States, colored	25,828	66.531
14	Wales	1,104	66.418
15	Russia	122	66.393
16	Switzerland	1,802	66.381
17	West Indies	580	66.307
18	France	3,243	66.277
19	Poland	171	66.211
20	Mexico	91	66.110
21	Italy	339	66.000
22	South America	79	65.899
23	Spain	148	65.635
24	Portugal	81	65.432

While blond races have statures superior to those of dark races, the same condition by no means holds in detail among themselves, as is shown by the following table. Stature, then, depends upon race, and not upon complexion.

TABLE 29.—*Height and complexion.*

Nativity.	Light complexioned.	Dark complexioned.	Total.	Mean height of light complexioned.	Mean height of dark complexioned.
United States	126,445	64,176	190,621	67.652	67.775
British America	9,506	4,859	14,365	67.169	67.073
England	6,804	2,845	9,649	66.582	66.621
Ireland	20,378	8,617	28,995	66.755	66.755
Germany	20,559	9,041	29,600	66.531	66.526

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[1] Medical statistics of the Provost Marshal General's bureau, Vol. I, p. 23.

TABLE 30.—*Stature of adult males arranged in order of greatest stature (Roberts's Manual).*

Race or nationality.	Authority.	Height (inches).
Polynesians	Garuat, Beechey, Porter, Cook, Rollins, etc	69.33
English (professional class)	Anthropological committee	69.14
Patagonians	Musters, D'Orbigny	69.00
Angamis of the Naga Hills	Woodthorp	69.00
Negroes of the Kongo	Topinard	68.95
Scotch (all classes)	Anthropological committee	68.71
Kafirs (South Africa)	Sir A. Smith	68.50
Iroquois Indians	Gold	68.28
Todas of the Nilghiries	Marshall	67.95
Negroes of Calabar	Topinard	67.95
North American Indians	Baxter	67.93
Irish (all classes)	Anthropological committee	67.90
United States whites (all classes)	Baxter	67.67
English (all classes)	Anthropological committee	67.66
Norwegians	Beddoe, Baxter	67.66
Zulus	Roberts	67.19
English (laboring classes)	Anthropological committee	67.08
Canadians	Baxter	67.01
Tajiks of Ferghana and Samarkand	Ujfalvy	67.10
Swedes (immigrants to United States)	Baxter and Beddoe	66.90
Chippewa Indians	Oliver	66.90
Kabyles	Topinard	66.85
Welsh (all classes)	Anthropological committee	66.66
Danes (immigrants to United States)	Baxter	66.65
Dutch (immigrants to United States)	do	66.62
American negroes	do	66.62
English (immigrants to United States)	do	66.58
Hungarians (immigrants to United States).	do	66.58
English Jews	Anthropological committee	66.57
Germans (immigrants to United States)	Baxter	66.54
Swiss of Geneva	Dunant	66.43
Swiss (immigrants to United States)	Baxter	66.38
Russians (immigrants to United States)	do	66.38
Belgians	Quetelet	66.38
French (immigrants to United States)	Baxter	66.23
Poles (immigrants to United States)	do	66.20
French (upper classes)	De Quatrefages	66.14
Germans	Novara	66.10
Mexicans	Baxter	66.10
Berbers of Algeria	Topinard	66.10
Arabs	Various	66.08
Usbeks of Ferghana and Samarkand	Ujfalvy	66.08
Javanese	Novara	66.08
Russians	Shultz	66.04
Italians (immigrants to United States)	Baxter	66.00
South Americans (immigrants to United States).	do	65.90
Australian aborigines	Various	65.68
Austrian Slavs	Ujfalvy	65.66
Galchas (Iranian mountaineers)	do	65.66
Spaniards (immigrants to United States)	Baxter	65.66
Berbers of Algeria	Topinard	65.62
Portuguese (immigrants to United States).	Baxter	65.43
Ainos	Rosky	65.33
Austrian Germans	Novara	65.27
French (working classes)	De Quatrefages	65.24
Esquimaux of North America	Various	65.10
Hungarians (military statistics)	Scheiber and Beddoe	65.04
Caucasians	Shortt	64.93
New Guinea (various tribes)	Various	64.78
Hindoos	Shortt	64.76
Bavarians	Novara	64.68
Ruthenians	Majer and Kopernicki	64.54
Dravidians	Shortt	64.50
Cingalese	Davy	64.48
Austrian Roumanians	Novara	64.37
Chinese	do	64.17
Italians	An. de Statist. 1879	64.00
Fuegans	Novara	63.98
Polish Jews	Majer and Kopernicki	63.88
Poles	do	63.87
Finns	Novara	63.60
Papuans	Various	63.20
Japanese	Mrs. Ayrton	63.11
Aymaras Indians (Peru)	Forbes	63.00
Peruvians	D'Orbigny	63.00
Cochin-Chinese	Finlayson	62.70
Malays	Raffles, Crawford, etc	62.34
Veddas of Ceylon	Bailey	60.42
Lapps	*Horch*	59.20

TABLE 30.—*Stature of adult males arranged in order of greatest stature (Roberts's Manual)*—Continued.

Race or nationality.	Authority.	Height (inches).
Andamanese	Man	58.70
Aëtas	De Quatrefages	58.30
Semangs	do	57.00
Mincopese	do	56.58
Bosjesmans (Bushmen of South Africa)	Various	52.78

Difference between tallest and shortest, 16.55 inches.
Average stature of man according to table, 65.25 inches.

TABLE 31.—*Height and weight at certain ages—Forbes.*[1]

Ages.	English.		Scotch.		Irish.		Belgian.	
	Height.	Weight.	Height.	Weight.	Height.	Weight.	Height.	Weight.
	Inches.	*Pounds.*	*Inches.*	*Pounds.*	*Inches.*	*Pounds.*	*Inches.*	*Pounds.*
18	68.1	138.0	68.55	139.0	68.7	145.5	67.2	134.0
20	68.7	144.0	69.1	146.5	69.8	148.0	67.9	143.0
21	68.7	146.0	69.2	148.5	70.0	151.0	60.8	145.5
23	68.9	149.0	69.3	151.0	70.2	154.0	68.2	148.5
24	68.9	150.0	69.3	152.0	70.2	155.0	68.2	149.5

Institutions.	Height.	Weight.
	Inches.	*Pounds.*
Virginia Military Institute	69	141.25
United States Military Institute, West Point	69	143.67
Southern California Medical College	69+	145.25
Jefferson College, Philadelphia, Pa	69+	145.00
Louisiana University	70.2	145.25
Nashville University Medical College	70.0	150.17
Michigan College	68.8	150.80

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[1] Charleston Journal 13, 1858, p. 502.

TABLE 32.—*Cincinnati police standard (Dun).*

I. Age. (1) Patrolmen must be between the ages of 21 and 40 years.
(2) Lieutenants must be between the ages of 21 and 50 years.
II. Height, weight, etc. Minimum height 5 feet 7½ inches.

Height.		Weight.	Chest measure.
Ft.	*in.*	*Pounds.*	*Inches.*
5	7½	140	34
5	8	144	34½
5	9	148	35
5	10	152	35½
5	11	156	36
6	..	160	37

Metropolitan police force of New York City.

I. Applicants must be between the ages of 21 and 30 years.
II. Height, weight, etc. Minimum height, 5 feet 7½ inches.

Height.		Weight.	Chest measure.
Ft.	*in.*	*Pounds.*	*Inches.*
5	7½	138	33½
5	8	140	34
5	9	145	34½
5	10	150	35
5	11	155	35½
6	..	160	36
6	1	165	36½
6	2	170	37
6	3	175	37½
6	4	180	38

United States Army standard.

I. Must be between the ages of 21 and 36 years.
II. Weight, height, etc.

Height.	Weight (Dr. Greenleaf, United States Army).	Weight (Adjutant General's).	Chest measure.
Ft. in.	*Pounds.*		
5 4	128	120 pounds........	No stated measures are required.
5 5	130		
5 6	132		
5 7	134		
5 8	141	Range between the figures in this column.	
5 9	148		
5 10	155		
5 11	162		There must be 2 inches chest expansion.
6 0	169		
6 1	176		
6 2	184	190 pounds........	

English Army standard.

Height.	Weight.	Chest measure.
Ft. in.	*Pounds.*	*Inches.*
5 6	133–140	38–39
5 7	140–147	39–40
5 8	147–155	40–41
5 9	155–164	41–42
5 10	164–174	42–43
5 11	174–185	43–44
6 0	185–196	44–45

Hutchinson's table of healthy weight.

From the average of 2,648 well-formed, healthy persons.

Height.	Weight.
Ft. in.	*Pounds.*
5 7	148
5 8	155
5 9	162
5 10	169
5 11	174
6 0	178

(D) COMPARATIVE TABLES OF HEIGHT AND WEIGHT.

The table following gives in comparative form the average heights and weights, arranged according to age and chronological order, of the most important investigations so far made within this field. For full titles of investigations here mentioned, see the bibliography which follows.

TABLE 33.—*Height and increments, in inches, according to various measurements.*

Ages, in years.	1		2		3		4		5		6		7		8		9		10	
	Quetelet, 1836, Belgium (10 of each age and sex).[1]		Zeising, 1854, Belgium.		Cowell, 1860, Manchester, England.		Boyd, 1861, London.		Bowditch, 1875, Boston (13,695 M., 10,904 F.).[2]		Medical statistics of provost marshal general, 1875 (190,621 American-born whites fit for Army).[3]		Bowditch, 1878, foreign.[4]		Roberts, 1878, England, artisan class (13,931).[5]		Roberts, 1878, England, favored classes (7,709).		Roberts, 1878, English towns (2,613).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0.	19.7	19.4					12.20	17.50												
	7.8	7.8																		
1.	27.5	27.2					1 to 2 years.													
	3.6	3.5																		
2.	31.1	30.7					28.50	27.70												
	2.9	2.9																		
3.	34.0	33.6					3 to 4 years.													
	2.5	2.4																		
4.	36.5	36.0					31.60	31.60							38.45					
	2.4	2.3													2.71					
5.	38.9	38.3					5 to 6 years.		41.57	41.19					41.16					
	2.3	2.3							2.18	2.16					2.02					
6.	41.2	40.6					37.50	37.00	43.75	43.35					43.18					
	2.3	2.2							1.99	2.17					1.83					
7.	43.5	42.8							45.74	45.52					45.01				46.16	
	2.2	2.2							2.02	2.06					1.98				1.15	
8.	45.7	45.0	49.34						47.76	47.58					46.99				47.31	
	2.3	2.1	.24						1.93	1.79					2.23				2.87	
9.	48.0	47.1	49.58				7 to 13 years.		49.69	49.37			52.00		49.22				50.18	
	2.1	2.1	1.76						1.99	1.97			1.51		1.30				2.55	
10.	50.1	49.2	51.34		50.5	49.5	47.00	45.00	51.68	51.34			53.51		50.52		53.40		52.73	
	2.1	2.0	.74		.8	2.2			1.65	2.08			1.45		1.00		1.51		1.11	
11.	52.2	51.2	52.08		51.3	*51.7*			53.33	*53.42*			54.96		51.52		54.91		53.84	
	1.9	2.0	1.46		1.9	1.9			1.78	2.46			1.82		1.47		2.06		1.67	
12.	54.1	53.2	53.54		53.2	*53.6*			55.11	*55.88*			56.78		52.99		56.97		55.51	
	1.9	1.9	1.58		1.6	2.0			2.10	2.3			2.82		2.94		1.82		2.79	
13.	56.0	55.1	55.12		54.8	*55.6*			57.21	*58.20*			59.60		55.93		58.79		58.30	
	1.8	1.8	1.18		1.9	2.3			2.66	1.7			1.90		1.83		2.32		1.54	
14.	57.8	56.9	56.30		56.7	*57.9*			59.88	59.94			61.50		57.76		61.11		59.84	
	1.8	1.7			2.4	.8			2.48	1.2			2.70		2.82		2.36		2.76	
15.	59.6	58.6			59.1	58.7	14 to 19 years.		62.36	61.10			64.20		60.58		63.47		62.60	
	1.6	1.3			3.1	.8			2.64	.5			1.63		2.35		2.93		2.50	
16.	61.2	59.9			62.2	59.5	60.50	57.70	65.00	61.58	64.11		65.83		62.93		66.40		65.10	
	1.6	1.0			1.6	1.2			1.16	.3	1.54		1.61		1.52		1.46		1.64	
17.	62.8	60.9			63.8	60.7			66.16	61.92	65.65		67.44		64.45		67.86		66.74	

1.26
68.00
1.16
60.16

.43
68.20
.43
68.72
.41
60.13
[illegible]
60.16
.77
60.03
—.41
68.52
.43
68.05

1.02
68.47
.55
68.02
.20
60.31

.0
07.44

.74
[illegible]

TABLE 33.—*Height and increments, in inches, according to various measurements*—Continued.

Ages, in years.	11		12		13		14		15		16		17		18		19		20		21		22	
	Roberts, 1878, English soldiers, policemen, etc. (29,525).		Roberts, 1878, English feeble-minded (829).		Roberts, 1878, England, all classes (30,000+).		Roberts, 1878, English Friends' School (4,661).		Kotelman, 1879, Hamburg (515).		Anthrop. Com., 1880, England, schools, military and naval colleges (29,405).[1]		Peckham, 1881, Milwaukee (U. S.) schools (4,773 M., 4,891 F.).		Hertle, 1882, Denmark (17,134 M., 11,250 F.).[2]		Peckham, 1882, American.[3]		Peckham, 1882, American (1 M., 1 F.).		Peckham, 1882, American (1 M., 1 F.).		Peckham, 1882, American (1).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0					19.52	19.31																		
					7.48	5.52																		
1					27.00	24.83																		
					.20	4.83																		
2					33.70	32.33														29.1				
					3.12	3.72																		
3					36.82	36.05																		
					1.64	2.09																		
4			38.00		38.46	38.14					36.8	36.2	39.98	39.65						38.3		40.0		
			2.03		2.57	1.68					1.7	2.1	2.30	2.07						2.6		1.5		
5	41.25		40.03		41.03	40.82					38.5	38.3	42.28	41.72						40.9		41.5		
	1.72		2.20		2.97	1.81					2.5	2.3	1.80	2.06						1.6		2.9		
6	42.97		42.23		44.00	42.63					41.0	40.6	44.08	43.78	44.1	44.1			46.3	42.5		44.4		
	2.25		1.89		1.97	1.82					3.0	2.3	2.01	2.15	1.2	1.2			1.7	1.8		2.0		
7	45.22		44.12		45.97	44.45					44.0	42.9	46.09	45.93	45.3	45.3			48.0	44.3		46.4		
	1.76		1.62		1.08	2.15					2.0	1.6	1.96	1.66	1.9	1.9			2.0	2.2		1.9		
8	46.98		45.74		47.05	46.60					46.0	44.5	48.05	47.59	47.2	47.2			50.0	46.5		48.3		47.7
	1.96		1.75		2.65	2.13					1.1	1.1	1.95	2.22	2.0	2.0			1.8	1.7		1.7		1.6
9	48.94		47.49		49.70	48.73	51.5		50.6		47.1	46.6	50.00	49.81	49.2	49.2			51.8	48.2		50.0		49.3
	1.37		1.62		2.14	3.12	1.8		.9		2.6	2.1	1.85	2.08	2.0	2.0			1.7	1.7		2.0		1.9
10	50.31		49.11		51.84	*51.85*	53.3		51.5		49.7	48.7	51.85	*51.89*	51.2	51.2			53.5	49.9		52.0		51.2
	.89		1.86		1.66	1.25	3.1		1.7		2.1	2.4	1.91	1.91	1.9	1.2			1.2	2.5		1.2		2.1
11	51.20		50.97		53.50	53.10	56.4		53.2		51.8	51.1	53.76	*53.8*	53.1	52.4			54.7	52.4		53.2		53.3
	1.30		1.49		1.49	2.46	1.3		1.9		1.7	2.0	1.24	2.7	1.2	1.9			1.4	1.5		1.9		2.7
12	52.52		52.46		54.99	*55.56*	57.7		55.1		53.5	53.1	55.0	*56.5*	54.3	54.3		55.9	56.1	53.9		55.1		56.0
	2.13		2.29		1.92	2.21	2.2		1.2		1.5	3.6	2.5	2.2	2.0	3.2		.6	1.9	2.3		1.0		2.5
13	54.65		54.75		56.91	*57.77*	59.9		56.3		55.0	*56.7*	57.5	*58.7*	56.3	*57.5*		56.5	58.0	56.2		56.1		58.5
	1.43		1.78		2.42	2.03	2.2		2.3		1.9	1.1	2.4	1.8	2.4	1.9		2.6	1.3	2.2		2.4		1.9
14	56.08		56.53		59.33	*59.80*	62.1		58.6		56.9	*57.8*	59.9	*60.5*	58.7	*59.4*		59.1	59.3	58.4	57.9	*58.5*		60.4
	3.02		2.73		2.91	1.13	2.1		2.1		2.4	2.0	2.4	1.1	2.7	1.2		2.5	3.2	2.6	1.5	2.2		.8
15	59.10		59.26		62.24	60.93	64.2		60.7		59.3	*59.8*	62.3	61.6	61.4	60.6		61.6	62.5	61.0	59.4	*60.7*		61.2
	4.80		1.43		2.07	.82	1.9		3.0		2.9	1.1	2.8	.6	3.2	2.0		1.9	3.6	.9	3.1	1.3		.1
16	63.90		60.69		64.31	61.75	66.1		63.7		62.2	60.9	65.1	62.2	64.6	62.6		63.5	66.1	*61.9*	62.5	62.0		61.3

17	2.01		1.98		1.93	.77	1.1		2.0		2.1	.8	1.5	.7	1.1			.3	2.8	.7	3.2	.5		
	65.91		62.67		66.24	62.52	67.2		65.7		64.3	61.7	66.6	62.9	65.7			62.8	68.9	62.6	65.7	62.5		61.3
18	.87		.54		.72	—.08			.6		1.9	.8		—.4	1.2				1.0	.4	1.1	1.0		.2
	66.78		63.21		66.96	62.44			66.3		66.2	62.5		62.5	66.9			63.8	69.9	63.0	66.8	63.5		61.5
19	.41		—.02		.33	.31			—.6		.8	—.1			0.0				1.0	.5				
	67.19		63.19		67.29	62.75			65.7		67.0	62.4			66.9			63.8	70.9	63.5	66.8	63.5		
20	.07		.99		.23	.23			.1		.3	.4												
	67.26		64.18		67.52	62.98			65.8		67.3	62.8												
21	.27		.07		.11	.05					.2	.2												
	67.53		64.25		67.63	63.03					67.5	63.0												
22	.09		.25		.05	—.16					.1	.0												
	67.62		64.50		67.68	62.87					67.6	63.0												
23					—.20	.14																		
					67.48	63.01																		
24					.24	—.31																		
					67.72	62.70																		
25					.03																			
					67.75																			
26					.03																			
					67.78																			
27					.14																			
	67.93				67.92																			
28					—.22																			
					67.70																			
29					.17																			
					67.87																			
34					67.89																			
36	67.22		64.87																					
39					68.09																			
45					67.96																			
47					67.92																			
49					67.41																			
51					69.22																			

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[1] See Galton, seventh reference.

[2] See Hertel, third reference.

[3] See Peckham, first reference.

TABLE 33.—*Height and increments, in inches, according to various measurements*—Continued.

Age, in years.	23		24		25		26		27		28		29		30		31		32	
	Peckham, 1882, American (1).		Peckham, 1882, Beloit College (533).		Peckham, 1882, American children (216).		Thoma, 1882, Germany, volksschüler.[1]		British report, 1883, English (first 4 years from Holt).		Shuttleworth, 1884, England.				Daffner, 1884, Germany (426 M., 344 F.).[2]		Daffner, 1884, Germany.		Daffner, 1885, Germany (700).	
											General population.		Idiots and imbeciles (209).							
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0									20.6	20.5					20.44	20.44				
									8.4	8.2					8.60	9.90				
1									29.0	28.7					29.04	*30.34*				
									3.5	3.8					4.49	2.47				
2					29.53	29.67			32.5	32.5					33.53	32.81				
					4.29	3.27			2.5	2.5					2.58	2.55				
3					33.82	32.94			35.0	35.0					36.11	35.36				
					3.24	3.37			3.0	3.0					1.87	2.35				
4		32.7			37.06	36.31			38.0	38.0	41.0	40.55	40.00	39.50	37.98	37.71				
		2.9							3.0	1.5	2.0	2.25	2.25	1.75	2.49	1.74				
5		35.6							41.0	40.5	43.0	42.80	42.25	41.25	40.47	39.45				
		2.5							3.0	2.3	2.0	1.65	1.75	2.00	1.19	1.41				
6		38.1							44.0	42.8	45.0	44.45	44.00	43.25	41.66	40.86				
		1.6							2.0	1.7	2.0	2.15	1.75	2.00						
7		39.7							46.0	44.5	47.0	46.60	45.75	45.25						
		2.6							1.0	2.1	2.0	2.13	1.75	2.25						
8		42.3					47.95		47.0	46.6	49.0	48.73	47.50	47.50						
		1.9					1.10		2.7	2.1	2.0	2.32	1.50	1.50						
9		44.2					49.05		49.7	48.7	51.0	51.05	49.00	49.00						
		1.8					1.70		2.1	2.3	2.0	2.05	2.00	2.00						
10		46.0					50.75		51.8	51.0	53.0	*53.10*	51.00	51.00						
		2.0					2.05		1.7	2.1	2.0	2.56	1.50	2.00						
11		48.0					52.80		53.5	53.1	55.0	*55.66*	52.50	*53.00*						
		1.3					1.88		1.5	2.5	2.5	2.11	2.25	2.00						
12		49.3					54.68		55.0	*55.6*	57.5	*57.77*	54.75	*55.00*						
		2.4					1.74		2.0	2.1	2.5	2.03	1.75	1.50						
13		51.7					56.42		57.0	*57.7*	60.0	59.80	56.50	56.50					58.14	
		1.0					6.46		2.3	2.1	2.0	1.13	2.75	1.50					.48	
14		52.7					*62.88*		59.3	*59.8*	62.0	60.93	59.25	58.00					58.62	
		2.0							2.9	1.1	2.0	.82	1.50	1.00					5.64	
15		54.7	63.34						62.2	60.9	64.0	61.75	60.75	59.00					64.26	
		2.4	1.79						2.1	0.8	1.5	.77	1.75	1.25					—.29	
16		57.1	65.13						64.3	61.7	65.5	62.52	62.50	59.25			64.0	59.1	63.97	
		2.8	.91						1.9	.8	1.0	.92	.75				.6	.7	2.03	
17		59.9	66.04						66.2	62.5	66.5	62.44	63.25				64.6	59.8	66.00	

18			1.84						.7	−.1	.5	.31	.00				1.1	.8	1.46	
			67.88						66.9	62.4	67.0	62.75	63.25				65.7	60.6	67.46	
19			.23						.4	.3	.25	.23	.75				.8	.8	.36	
			68.11						67.3	62.7	67.25	62.98	64.00	59.50			66.5	61.4	67.82	
20			.43						.2	.2	.25	.05	.25				.6	.6	.55	
			68.54						67.5	62.9	67.5	63.03	64.25				67.1	62.0	68.37	
21			.23						.1	.1		−.16	.25				.6	.6	−2.35	
			68.77						67.6	63.0		62.87	64.50				67.7	62.6	66.02	
22			−.10									.14					.6	.6	3.25	
			68.67									63.01					68.3	63.2	69.27	
23			.29									−.31					.8	.6		
			68.96									62.70					69.1	63.8		
24			.34														.0	.8		
			69.30														69.1	64.6		
25			.41														1.8	1.0		
			69.71														70.9	65.6		
26																	.8	.7		
																	71.7	66.3		
27																				
28											67.75	62.02	64.75	59.75						

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[1] One-half year should be added to the ages given for the measurements in this column.

[2] See Daffner, first reference.

TABLE 33.—*Height and increments, in inches, according to various measurements*—Continued.

Age, in years.	33		34		35		36		37		38		39		40		41		42		43	
	Greenwood, 1886, American, white (724).		Greenwood, 1886, American, negro (223).		Michailoff, 1887, Russia, Dorfschüler.[1]		Michailoff, 1887, Russia, Elementarschöl.[1]		Michailoff, 1887, Russia, Stadtschüler.[1]		Cordeiro, 1887, M. D. in United States Navy (5,401).		Suligowski, 1887, Radom (1,133).		Landsberger, 1888, Posen (104).[2]		Erismann, 1888, Moscow, (3,212 M., 1,495 F.).[3]		Erismann, 1888, Russia.		Stevenson, 1887, English-speaking people from England and America.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
5																					41.30	41.05
																					2.58	1.94
6															42.1						43.88	42.99
															2.1						1.98	1.99
7															44.2		44.1	43.9			45.86	44.98
															2.00		2.3	1.9			1.55	2.11
8					46.34	46.3	47.42		46.38	45.80					46.2		46.4	45.8			47.41	47.09
					1.30	1.54	1.46		1.96	1.28					1.9		1.9	1.3			2.28	1.96
9					47.64	*47.84*	48.88		48.34	47.08			49.6		48.1		48.3	47.1	47.29		49.69	49.05
					2.20	1.38	1.74		3.16	2.12			1.5		1.3		3.2	2.1	.90		2.07	2.14
10					49.84	49.22	50.62		51.50	49.20			51.1		49.4		51.5	49.2	48.19		51.76	51.19
					1.16	1.36	1.30		1.88	1.84			1.6		1.8		1.9	1.9	1.53		1.71	2.07
11	52.3	51.5	50.2	51.6	51.00	50.58	51.92		53.38	51.04			52.7		51.2		53.4	51.1	49.72		53.47	53.26
	1.0	1.7	.4	1.9	1.70	1.80	1.46		1.78	1.26			1.4		2.0		1.8	1.2	1.42		1.58	2.51
12	53.3	53.2	50.6	53.5	52.70	52.38	53.38		55.16	52.30			54.1		53.2		55.2	52.3	51.14		55.05	*55.77*
	2.1	2.2	3.4	2.0	1.58	1.86	1.92		2.08	2.12			2.4		1.9		2.0	2.2	1.77		2.01	2.19
13	55.4	55.4	54.0	*55.5*	54.28	54.24	55.30		57.24	54.42	59.00		56.5		55.1		57.2	54.5	52.91		57.06	*57.96*
	1.9	1.8	1.7	1.5	1.18		1.96		1.88	2.96	2.10		2.2				1.9	2.9	1.31		2.54	1.91
14	57.3	*57.2*	55.7	*57.0*	55.46		57.26		59.12	57.38	61.10		58.7				59.1	57.4	54.22		59.60	*59.87*
	2.2	2.0	2.1	2.1	1.42				2.46	.24	2.36		2.8				2.5		1.37		2.67	1.14
15	58.5	*59.2*	57.8	*59.1*	56.88				61.58	57.62	63.46		61.5				61.6		55.59		62.27	61.01
	4.3	2.6	4.3	1.5					1.96	1.53	1.48		2.0				1.9		2.16		2.39	.66
16	62.8	61.8	62.1	60.6					63.54	59.15	64.94		63.5				63.5		57.75		64.66	61.67
									1.00				1.7				1.1		2.57		1.54	.55
17									64.54				65.2				64.6		60.32		66.20	62.22
													.3						2.12		.61	—.03
18													65.5						62.44		66.81	62.19
													—.2						1.26			
19													65.3						63.70			
													1.1						.71			
20													66.4						64.41			
													—.7						.31			
21													65.7						64.72			

Ages, in years.	44		45		46		47		48		49		50		51		52		53		54	
	Carstädt, 1888, Breslau (600).		Karlstädt, 1888, Germany (Höhere Schule).[1]		Geissler, 1888, Gohlis (1,386 M., 1,420 F.).		Key, 1889, Sweden (15,000 M., 3,000 F.).[4]		Simon, 1889, French (223).		Pagliani, 1890, Turin (1,008 M., 968 F.).		Stevenson, 1888-1890, England, nonlaboring.		Stevenson, 1888-1890, England, laboring.		Wiener, 1890, German (1).		Wiener, 1890, German (1).		Wiener, 1890, German (1).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0																	21.16		18.11		20.63	
																	7.07		9.76		8.58	
1																	28.23		27.87		29.21	
																	5.08		5.12		4.81	
2																	33.31		32.99		34.02	
																	3.34		3.34		3.07	
3											33.9	33.3					36.65		36.33		37.09	
											2.3	2.7					2.76		3.23		3.02	
4											36.2	36.0					39.41		39.56		40.11	
											2.0	2.0					2.48		2.96		2.41	
5											38.2	38.0					41.89		42.52		42.52	
											2.5	2.2					2.88		2.37		2.56	
6	43.0				43.4	43.0	45.6	44.5			40.7	40.2					44.77		44.89		45.08	
	1.8				1.6	1.8	2.0	1.2			3.6	2.8					2.39		2.20		2.32	
7	44.8				45.0	44.8	47.6	45.7			44.3	43.0					47.16		47.09		47.40	
	2.0				2.0	1.5	2.0	2.7			2.3	2.5					2.13		2.12		2.09	
8	46.8		47.88		47.0	46.3	49.6	48.4	43.58		46.6	45.5					49.29		49.21		49.49	
	1.9		1.73		1.8	2.5	2.0	1.6	1.94		2.2	2.1					2.08		2.08		2.12	
9	48.7		49.61		48.8	48.8	51.6	50.0	45.52		48.8	47.6					51.37		51.29		51.61	
	1.9		1.88		2.0	1.8	.8	2.0			1.0	2.5					1.70		1.78		2.21	
10	50.6		51.49		50.8	50.6	52.4	52.0			49.8	*50.1*	53.0		50.5		53.07		53.07		53.82	
	1.9		1.90		1.3	2.1	1.1	1.9			1.1	1.6	1.5		1.0		2.32		2.28		2.17	
11	52.5		53.39		52.1	*52.7*	53.5	*53.9*	49.33		50.9	*51.7*	54.5		51.5		55.39		55.35		55.99	
	1.9		1.84		2.3	2.2	1.6	2.4	2.69		1.7	2.1	2.0		2.0		2.17		2.24		1.18	
12	54.4		55.23		54.4	*54.9*	55.1	*56.3*	52.02		52.6	*53.8*	56.5		53.5		57.56		57.59		57.17	
	2.0		2.17		1.0	2.2	1.6	2.0	.76		2.4	2.3	2.0		2.0		3.34		3.23		2.63	
13	56.4		57.40		55.4	*57.1*	56.7	*58.3*	52.78		55.0	*56.1*	58.5		55.5		60.90		60.82		59.80	
	2.3		2.56				2.0	1.9	2.93		2.2	2.8	2.5		2.5		3.75		2.73		2.05	
14	58.7		59.96				58.7	*60.2*	55.71		57.2	*58.9*	61.0		58.0		64.65		63.55		61.85	
	3.0						2.7	1.6	2.04		2.6	1.2	2.5		2.5		1.89		3.03		3.70	
15	61.7						61.4	*61.8*	57.75		59.8	*60.1*	63.5		60.5		66.54		66.58		65.55	
	2.4						2.4	.8	2.37		2.4	.5	3.0		2.5		.94		1.65		2.25	
16	64.1						63.8	62.6	60.12		62.2	60.6	66.5		63.0		67.48		68.23		67.80	
							1.9	.4	1.18		.8	.4	1.5		1.5		.51		.71		1.38	
17							65.7	63.0	61.30		63.0	61.0	68.0		64.5		67.99		68.94		69.18	

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[1] One-half year should be added to the ages given for the measurements in this column.

[2] See Landsberger, first reference.

[3] See Erismann, first reference.

[4] See Key, first reference.

TABLE 33.—*Height and increments, in inches, according to various measurements*—Continued.

Ages, in years.	44		45		46		47		48		49		50		51		52		53		54	
	Carstädt, 1888, Breslau (600).		Karlstädt, 1888, Germany (Höhere Schule).		Geissler, 1888, Gohlis (1,386 M., 1,420 F.).		Key, 1889, Sweden (15,000 M., 3,000 F.).[1]		Simon, 1889, French (223).		Pagliani, 1890, Turin (1,098 M., 968 F.).		Stevenson, 1888-1890, England, nonlaboring.		Stevenson, 1888-1890, England, laboring.		Wiener, 1890, German (1).		Wiener, 1890, German (1).		Wiener, 1890, German (1).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
18							1.2	0.0			0.3	0.0	0.5		1.0		0.04		0.46		0.34	
							66.9	63.0			63.3	61.0	68.5		65.5		68.03		69.40		69.52	
19							.4	.8			.4		.2		.5		.04		.08		.36	
							67.3	63.8			63.7		68.7		66.0		68.07		69.48		69.88	
20							.4	—.8					.3		.2				.04		.11	
							67.7	63.0	62.64				69.0		66.2		68.07		69.52		69.99	
21													.0		.3							
													69.0		66.5							
23									62.95													
25																	.12		.04		.17	
																	68.19		69.56		70.16	
30													69.0		66.5							

Age, in years.	55		56		57		58		59		60		61		62		63		64		65	
	Wiener, 1890, German (1).		Greenwood, 1890, foreign (385).		Greenwood, 1890, American white (2,619).		Greenwood, 1890, American negro (574).		Hasse, 1891, Germany, I Bürgerschüle.[2]		Hasse, 1891, Germany, II Bürgerschüle.[2]		Geissler, 1892, Freiburg (10,343 M., 10,830 F.).[3]		Barnes, 1892, Oakland, Cal. (4,956).		Schmidt, 1892, Sallfeld (4,699 M., 4,807 F.).		Porter, 1893, St. Louis, (16,295 M., 18,059 F.).[4]		Hanna, 1893, Oberlin College (500 F. students).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0	21.65																					
1	7.48																					
	29.13																					
2	4.69																					
	33.82																					
3	3.70																					
	37.52																					

4	3.51																					
	41.03																					
5	2.75																					
	43.78																					
6	2.16																					
	45.94												42.8	42.5	44.1	44.4	43.0	42.7	42.9	42.		
7	2.88												1.5	1.6	.9	.5	2.0	2.2	2.0	2.		
	48.82												44.3	44.1	45.0	44.9	45.0	44.9	44.9	44.		
8	2.51												2.0	1.8	2.6	1.9	2.2	1.7	2.0	2.		
	51.33								47.44	47.44	46.70	45.80	46.3	45.9	47.6	46.8	47.2	46.6	46.9	46.		
9	2.33								2.17	2.17	1.68	2.70	1.8	1.9	1.7	2.4	2.0	2.2	2.1	2.		
	53.66								49.61	49.61	48.38	48.50	48.1	47.8	49.3	49.2	49.2	48.8	49.0	48.		
10	2.01								1.92	1.64	2.00	1.92	1.5	1.8	2.6	2.3	1.3	2.1	1.7	1.9		
	55.67								51.53	51.25	50.38	50.42	49.6	49.6	51.9	51.5	50.5	50.9	50.7	50.		
11	1.81								1.31	1.94	1.46	2.08	1.8	2.0	1.6	2.4	1.8	1.7	2.0	1.		
	57.48			50.50	52.00	51.08	51.00	49.80	52.84	*53.19*	51.84	*52.50*	51.4	51.6	53.5	*53.9*	52.3	*52.6*	52.7	52.		
12	2.72			2.30	1.00	1.02	2.36	3.00	1.96	2.71	2.40	1.96	1.9	1.7	1.6	2.7	2.0	2.0	1.7	2.		
	60.20		53.98	52.80	53.00	52.70	53.36	52.80	54.80	*55.90*	54.24	*54.46*	53.3	53.3	55.1	*56.6*	54.3	*54.6*	54.4	*54.8*		
13	3.89		.79	3.76	3.00	1.32	.37	1.20	.79	2.05	1.06	2.34	1.9	2.4	1.7	3.4	1.7	2.2	1.9	2.9		
	64.09		54.77	*56.56*	56.00	54.02	53.73	*54.00*	55.59	*57.95*	55.30	*56.80*	55.2	*55.7*	56.8	*60.0*	56.0	*56.8*	56.3	*57.7*		
14	2.14		3.83	3.67	3.60	3.41	2.27	2.85	2.79	1.31	1.51	1.32			2.9	1.2			2.0	1.6		
	66.23		58.60	*60.23*	56.60	*57.43*	56.00	*56.85*	58.38	*59.26*	56.81	*58.12*			59.7	*61.2*			58.3	*59.3*		59.25
15	2.67		.45	1.88	2.00	2.88	2.88	1.90							2.1	.7			2.7	1.		59.48
	68.90		59.05	*62.11*	58.60	*60.31*	58.88	58.75							61.8	*61.9*			61.0	61.0		
16	1.29		3.36	3.47	3.80	2.19	2.12	2.79							2.7	.8			2.1	1.0		60.70
	70.19		62.41	*65.58*	62.40	*62.50*	61.00	*61.54*							64.5	62.7			63.1	62.0		62.94
17	.59				1.50	.40	3.44	1.26							2.6	.0			1.9	.7		62.35
	70.78				63.90	62.90	64.44	62.80							67.1	62.7			65.0	62.7		61.34
18	.20				.90	.39	.56	3.2							.5	.5				.1		61.61
	70.98				64.80	63.29	65.00	66.00							67.6	63.2				62.8		62.01
19	.16				1.86	.91														.4		62.56
	71.14				66.66	64.20														63.2		63.11
20	.08																					63.30
	71.22																					63.90
21																						63.17
																						64.03
22																						64.88
23																						65.24
																						65.71
27																						66.34
28																						67.09
31																						68.11

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[1] See Key, first reference.

[2] One-half year should be added to the ages given for the measurements in this column.

[3] See Geissler, second reference.

[4] See Porter, second reference.

TABLE 33.—*Height and increments, in inches, according to various measurements*—Continued.

Ages in years.	66		67		68		69		70		71		72		73		74		75		76		77	
	Hastings, 1893, American, Amherst College (1,321).[1]		Hastings, 1893, American, Amherst College (2,106).		Sack, 1893,[2] Russia, gymnasium.[3]		Hanna, 1893, Oberlin College (1,600 students).		Kosmowsky, 1894, Russia, farien koloniel.[3]		Report of Surgeon General, U. S. Army, recruits accepted in 1894.						Porter, 1894, St. Louis (15,525 M., 16,527 F.).[5]		West, 1894, Worcester (3,250).[6]		Gilbert, 1894, New Haven (602 M., 584 F.).		Beyer, 1895, American naval cadets (4,537).[7]	
											Native white (4,547).[4]		Foreign-born white (2,388).		Negro (499).									
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
5																			43.2	42.3				
																			1.2	1.5				
6																	42.89	42.19	44.4	43.8	45.0	44.9		
																	2.00	2.28	1.7	2.5	2.1	2.0		
7																	44.89	44.47	46.1	*46.3*	47.1	46.9		
																	2.01	2.13	2.1	1.6	1.8	1.5		
8					49.13				46.19	45.88							46.90	46.60	48.2	47.9	48.9	48.4		
					2.16				1.65	1.42							2.06	2.09	1.8	1.9	2.3	2.4		
9					51.29				47.84	47.30							48.96	48.69	50.0	49.8	51.2	50.8		
					1.39				2.04	1.96							1.77	1.87	2.8	2.5	1.8	2.0		
10					52.68				49.88	49.26							50.73	50.56	52.8	52.3	53.0	52.8		
					1.65				1.62	1.96							1.97	1.88	1.8	1.6	2.9	1.8		
11					54.33				51.50	51.22							52.70	52.44	54.6	53.9	55.9	54.6		
					1.77				1.96	1.97							1.71	2.33	1.7	3.1	1.1	3.3		
12					56.10				53.46	53.19							54.41	*54.77*	56.3	*57.0*	57.0	*57.9*		
					2.08				1.04	1.27							1.85	2.92	1.8	1.2	1.8	2.5		
13					58.18				54.50	54.46							56.26	*57.69*	58.1	*58.2*	58.8	*60.4*		
					3.08				4.54	2.23							2.24	1.69	2.6	2.3	.5	1.0		
14					61.26			58.2	59.04	56.69							58.50	*59.38*	60.7	60.5	59.3	*61.4*		
					2.29												2.48	1.66	3.2	1.3	3.5	1.1		
15					63.55												60.98	*61.04*	63.9	61.8	62.8	62.5	63.80	
					1.69												2.12	.98	1.4	.6	2.9	.0	2.13	
16					65.24			59.0			64.58						63.10	62.02	65.3	62.4	65.7	62.5	65.93	
					.95			59.8			1.86						1.91	.71	1.0	.4	1.4	1.1	1.12	
17	66.16		66.60		66.19			60.2			66.44						65.01	62.73	66.3	62.8	67.1	63.6	67.05	
	.43		.36		.51			60.7			1.01						2.08	.03	.6	—.2			.24	
18	66.59		66.96		66.70			61.4			67.45		66.65		66.10		67.09	62.76	66.9	62.6			67.29	
	—.52		.34		.31			61.7			—.04		.88		.57			—.38	.5	.1			.61	
19	66.07		67.30		67.01			62.4			67.41		67.53		66.67			62.38	67.4	62.7			67.90	
	1.73		.65		—.19			62.6			.69		—.87		1.02			.37	1.1	—.1			.60	
20	67.80		67.95		66.82			63.1			68.10		66.66		67.69			62.75	68.5	62.6			68.50	
	—.08		.06					63.5			—.89		.49		—.45			.23	—1.4	.1			.10	
21	67.72		68.01								67.21		67.15		67.24			62.98	67.1	62.7			68.60	

	.43		.10					64.1			.47		.11		—.08								—.18	
22	68.15		68.11					64.5			67.68		67.26		67.16								68.45	
	.11		.20								.06		—.23		.21								.17	
23	68.26		68.31					64.9			67.74		67.03		67.37								68.62	
	.42		.13								—.18		.50		—.19									
24	68.68		68.44					65.5			67.56		67.53		67.18									
	.15		.24								—.01		—.61		.28									
25	68.83		68.68								67.55		66.92		67.46									
	—.39		.14								.10		.51		—.04									
26	68.44		68.82					66.3			67.65		67.43		67.42									
	—.12		—.52								—.20		—.39		.03									
27	68.32		68.30					67.0			67.45		67.04		67.45									
	.34		.22								.09		.37		—.34									
28	68.66		68.52								67.54		67.41		67.11									
	—.58		—.43								.24		—.11		.42									
29	68.08		68.09								67.78		67.30		67.53									
	1.11		1.10								—.03		—.10		—1.32									
30	69.19		69.19								67.75		67.20		66.21									
											—.08		.01		.26									
31											67.67		67.21		66.47									
											—.11		.05		1.28									
32								67.3			67.56		67.26		67.75									
											—.35		.00		—.99									
33											67.21		67.26		66.76									
											.73		—.16		.69									
34											67.94		67.10		67.45									
											—.76		.13		.49									
35											67.18		67.23		67.94									
											.22		—.06		—.70									
36											67.40		67.17		67.24									
											.07		—.48		.34									
37											67.47		66.69		67.58									
											—.37		.34		—.58									
38											67.10		67.03		67.00									
											.91		—.03		—1.56									
39											68.01		67.00		65.44									
											—.55		.23		1.64									
40											67.46		67.23		67.08									
											—1.05		—1.00		1.11									
41											66.41		66.23		68.19									

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[1] See Hastings, fourth reference.

[2] See Sack, second reference.

[3] One-half year should be added to the ages given for the measurements in this column.

[4] See Sternberg.

[5] See Porter, second reference.

[6] See West, third reference

[7] See Beyer, first reference.

TABLE 33.—*Height and increments, in inches, according to various measurements*—Continued.

Ages in years.	78		79		80		81		82		83		84		85		86		87		88		89	
	Hall, 1895, Pennsylvania (2,434).		Combe, 1896, Lusanne (2,000).		Boas, 1897, Oakland, Cal., (2,053 M., 2,377 F.).[1]		Boas, 1897, American (2,386 M., 1,967 F.).		Boas, 1897, American (45,151 M., 43,298 F.).		Gilbert,[2] 1897, Iowa (50 M., 50 F.).[3]		MacDonald, 1898, Washington (7,953 M., 8,520 F.), white.		Boas, 1898, half bloods and Indians.[4]		Hrdlicka, 1899, white.		Hrdlicka, 1899, colored.		Hrdlicka, 1899, Italian.		Smedley, 1900, Chicago (2,788 M., 3,471 F.).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
3																			30.85	33.06				
4																				2.61				
																				35.67				
5																			10.25	3.11				
									41.69	41.29					41.26	38.35	37.84	39.52	41.10	38.78				
6									2.24	2.05							3.54	2.21	2.24	4.14				
					44.76	44.29	44.05	44.09	43.93	43.34	45.0	44.6	44.5	44.2			41.38	41.73	43.34	42.92	40.34	41.62	43.58	43.18
7					1.70	1.97	1.37	2.01	2.06	2.36	*2.8*	*2.2*	1.5	.9			2.72	1.06	1.78	1.42	3.46	.92	44.59	44.30
			46.2	45.8	46.46	46.26	46.42	46.10	45.99	45.70	47.8	46.8	46.0	45.1	42.87		44.10	42.79	45.12	44.34	43.80	42.54	45.60	45.43
8			2.0	1.9	2.69	2.01	1.93	2.97	2.06	2.02	*1.8*	*2.4*	1.8	2.3	3.67		1.26	1.70	1.96	5.24	.82	1.12	46.61	46.54
			48.2	47.7	49.15	48.27	48.35	48.07	48.05	47.72	49.6	49.2	47.8	47.4	46.54	51.03	45.36	44.49	47.08	*49.58*	44.62	43.66	47.61	47.44
9			1.8	1.8	1.36	2.01	1.96	1.93	1.92	1.94	1.7	*2.1*	1.9	1.7	3.46		2.36	2.24	2.16	−.12	2.50	1.80	48.61	48.33
	51.2		50.0	49.5	50.51	50.28	50.31	50.00	49.97	49.66	51.3	51.3	49.7	49.1	50.00		47.72	46.73	49.24	*49.46*	47.12	45.46	49.66	49.31
10	2.7		1.7	2.1	2.01	2.28	2.01	2.36	1.91	2.02	2.0	*1.7*	2.0	2.1			1.41	3.15	.80	1.50	1.46	3.58	50.71	50.30
	53.9		51.7	51.6	52.52	*52.56*	52.32	52.36	51.88	51.68	53.3	53.0	51.7	51.2			49.13	49.88	50.04	*50.96*	48.58	49.04	51.54	51.21
11	1.2		1.6	2.1	1.77	2.12	1.77	1.66	1.74	2.11	1.9	*1.5*	1.5	1.9			2.64	1.45	3.50	.46	2.08	1.72	52.38	52.24
	55.1		53.3	*53.7*	54.29	*54.68*	54.09	54.02	53.62	*53.79*	55.2	54.5	53.2	53.1	57.01		51.77	51.33	53.54	51.42	50.66	50.76	53.20	*53.29*
12	1.6		1.7	2.2	1.85	2.41	2.05	2.79	1.79	2.32	1.9	*3.5*	1.9	2.7			1.86	2.10	.84	6.32	1.96	1.82	54.02	*54.45*
	56.7		55.0	*55.9*	56.14	*57.09*	56.14	*56.81*	55.41	*56.11*	57.1	58.0	55.1	*55.8*		52.99	53.63	53.43	54.38	*57.74*	52.62	52.58	54.94	*55.64*
13	4.3		1.9	2.0	2.21	2.59	2.09	2.21	2.07	2.43	1.6	*1.2*	1.7	2.1		7.17	2.27	2.91	.42	.38	1.22	1.50	55.87	*56.82*
	61.0		56.9	*57.9*	58.35	*59.68*	58.23	*59.02*	57.48	*58.54*	58.7	59.2	56.8	*57.9*		60.16	55.90	56.34	54.80	*58.12*	53.84	*54.08*	57.30	*58.15*
14	1.3				2.91	1.97	2.64	1.56	2.52	1.89	3.0	*2.5*	2.3	1.3			1.15	2.52	4.42	3.26	5.40	4.30	58.70	*59.47*
	62.3				61.26	*61.65*	60.87	60.58	60.00	*60.43*	61.7	61.7	59.1	*59.2*	57.71		57.05	*58.86*	59.22	*61.38*	48.24	*58.38*	59.82	*60.49*
15	3.0				2.99	.44	2.91	1.19	2.88	1.18	3.0	*1.6*	2.7	2.4			.51	1.58	−1.94	−.18	5.18		60.93	*61.52*
	65.3				64.25	62.09	63.78	61.77	62.88	61.61	64.7	63.3	61.8	61.6			57.56	*60.44*	57.28	*61.20*	53.42		62.24	61.75
16	1.2				1.42	.78	1.57	.12	2.04	.61	2.0	*0*	2.5	.8			6.03	−1.47	1.76				63.55	61.99
	66.5				65.67	62.87	65.35	61.89	64.92	62.22	66.7	63.3	64.3	62.4			63.59	58.97	59.04				64.59	62.33
17	.6					.00	1.01	.75	1.58	.43	1.5	*1.2*	1.7	.6			−2.41						65.62	62.68
	67.1					62.87	66.36	62.64	66.50	62.65	68.2	64.5	66.0	63.0			61.18						66.10	62.71
18	.2								.85		.4	*.1*	1.1	.1				2.21					66.56	62.74
	67.3								67.35		68.6	64.6	67.1	63.1	65.12	62.29		61.18					67.42	62.77
19	.2										.4	*0*			4.56								68.28	62.80
	67.5										69.0	64.6			69.68									

20	.1													—.90										
	67.6													68.78	59.84									
21	.1																							
	67.7																							
22															59.21									
23															—.43									
														69.84	58.78									
25														64.96										
27														64.41	62.40									
28														−1.26	—.31									
														63.15	62.09									
29															—.95									
															61.14									
30															—.43									
														62.25	60.71									
31															−2.36									
															58.35									
33															62.91									
34														63.08										
35														.62										
														63.70	63.82									
40														66.93	58.22									
41															3.04									
															61.26									
42															−3.23									
															58.03									
43														66.26										
44														−3.97										
														62.29	56.26									
45														2.32										
														64.61										
46														−2.32										
														62.29	53.07									

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[1] See Boas, ninth reference.

[2] The ages for this school are one-half year greater than for the others.

[3] See Gilbert, first reference.

[4] See Boas, thirteenth reference.

TABLE 33.—*Height and increments, in inches, according to various measurements*—Continued.

Ages, in years.	90		91		92		93		94		95		96		97		98		99		100	
	Amherst Col., 1900, America (4,880).[1]		Hastings, 1902, America (5,476).[2]		Hastings, 1902, Nebraska (7,700 M., 7,069 F.).[3]		Rietz, 1903, Berlin, Gymnasium (1,740 M., 533 F.).		Rietz, 1903, Berlin, Gemeideschulen (1,496 M., 1,365 F.).		Ranke, 1905, Germany, (1,457 M., 1,000 F.).		Hoesch Ernst, 1906, German, Volksschulen (175 M., 175 F.).[4]		Bobbitt, 1909, Philippine Islands (1,180 M., 438 F.).		Bobbitt, 1909, China (60).		Baldwin, Chicago, 1910 (400 M., 500 F.).		Misawa, 1909, Japan.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0											19.61	19.10										
											4.99	5.19										
1											24.60	24.29										
											5.70	5.42										
2											30.30	29.71										
											4.09	3.77										
3											34.39	33.48										
											2.08	2.68										
4											36.47	36.16										
											2.67	1.96										
5			41.60		41.57	41.41					39.14	38.12							46.32	43.24		
			1.95		1.92	1.78					2.48	4.03							47.64	44.88		
6			43.55		43.49	43.19	46.49	*46.77*	44.63	43.98	41.62	*42.15*			43.09				47.65	46.46		
			2.00		1.98	1.98	1.46	1.45	1.43	2.10	2.28	2.49			1.59				47.64	47.64		
7			45.55		45.47	45.17	47.95	*48.22*	46.06	*46.08*	43.90	*44.64*			44.68	*45.08*			49.21	48.83	41.92	41.46
			2.20		2.20	2.05	2.08	1.77	1.65	1.75	2.04	1.14			1.38	1.18			50.39	49.21	1.78	1.65
8			47.75		47.67	47.22	50.03	49.99	47.71	*47.83*	45.94	45.78	49.63	48.71	46.06	*46.26*			51.57	50.00	43.70	43.11
			1.80		1.79	2.36	1.53	1.49	1.35	1.30	1.81	2.28	0.00	.50	1.58	2.24			51.96	51.18	1.82	1.81
9			49.55		49.46	49.58	51.56	51.48	49.06	*49.13*	47.75	*48.06*	49.63	49.21	47.64	*48.50*	48.70		52.76	52.37	45.52	44.92
			2.00		2.00	2.02	1.77	1.85	2.37	2.20	2.24	1.97	2.02	3.40	1.45	1.62	1.50		53.94	53.45	1.72	1.73
10			51.55		51.46	51.60	53.33	53.33	51.43	51.33	49.99	*50.03*	51.65	*52.61*	49.09	*50.12*	50.20		54.72	54.34	47.24	46.65
			1.55		1.55	1.52	1.49	2.16	1.74	2.00	1.41	1.77	1.31	1.37	2.05	.40	.43		55.12	55.51	1.88	1.86
11			53.10		53.01	53.12	54.82	*55.49*	53.17	*53.33*	51.40	*51.80*	52.96	*53.98*	51.14	50.52	50.63		55.91	*56.69*	49.12	48.51
			2.15		2.12	2.70	2.32	2.60	1.66	2.00	1.81	2.00	1.68	1.13	2.42	2.55	.21		57.09	*57.49*	1.55	2.00
12			55.25		55.13	*55.82*	57.14	*58.09*	54.83	55.33	53.21	*53.80*	54.64	*55.11*	53.56	53.07	50.84		57.41	*58.66*	50.67	50.51
			1.85		1.49	2.55	2.05	1.69	2.04	2.87	1.69	1.65	1.94	3.31	1.68	3.03	2.87		59.06	*60.24*	1.86	1.98
13			57.10		56.62	*58.37*	59.19	*59.78*	56.87	*58.20*	54.90	*55.45*	56.58	*58.42*	55.24	*56.10*	53.71		59.85	*60.02*	52.53	52.49
			2.35		2.73	1.83	2.12	1.76	.74	.94	1.90	2.01	.63	.75	2.67	1.18	3.06		61.02	*61.81*	1.65	1.73
14			59.45		59.35	*60.20*	61.31	*61.54*	57.61	*59.14*	56.80	*57.46*	57.21	*59.17*	57.91	57.28	56.77		62.60	62.21	54.18	*54.22*
			2.80		2.81	1.42	2.51	.55			1.99	.51			2.80	.99	5.63		64.57	62.60	1.77	1.53
15			62.25		62.16	61.62	63.82	62.09			58.79	57.97			60.71	58.27	62.40		64.96	62.60	55.95	55.75
			2.20		2.18	.44	1.34								1.57	.31			65.75	62.99	1.57	.83
16	67.4		64.45		64.34	62.06	65.16								62.28	58.58			65.75	63.39	57.52	56.58

	.5				2.46	.09	1.26								.91	.48			60.82	62.99		
17.	67.9				66.80	62.64	66.42								63.19	59.06			60.32	63.78		
	.3				.43	.14	.78								.16	−.40			66.32	64.17		
18.	68.2				67.23	62.78	67.20								63.35	58.66						
	.0				.30	.13	−.16								.43	.22						
19.	68.2				67.53	62.91	67.04								63.78	58.88						
	−.1				.16	.29									.08	−.48						
20.	68.1				67.68	63.20									63.86	58.50						
	.0														−.47							
21.	68.1														63.39							
	.1																					
22.	68.2																					
	−.1																					
23.	68.1																					
	.1																					
24.	68.2																					
	.0																					
25.	68.2																					
	.7																					
26.	68.9																					

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[1] See Hitchcock, twelfth reference.

[2] See Hastings, fourth reference.

[3] See Hastings, first reference.

[4] One-half year should be added to the ages given for the measurements in this column.

TABLE 33.—*Height and increments in inches, according to various measurements*—Continued.

Ages, in years.	101		102	103	104		105		106		107		108		109		110		111		112	
	Misawa, 1901, Japan.		Wisawa, 1909, Japan.	Weissenberg, 1911, German.					Goddard, 1912, Vineland, N. J. (5,656 M., 4,723 F.).						Baldwin, 1913, Chicago and New York (100 M., 100 F.).		Baldwin, 1913, American, F.W. Parker School, Chicago (1 M., 1 F.).		Baldwin, 1913, American, Friends' School, Washington, (1 M., 1 F.).		Baldwin, 1913, Chicago (501M., 706 F.).	
				Poor.	Middle.		Wealthy.		Moron.		Imbecile.		Idiot.									
	M.	F.	M.	M.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0	19.30	19.20																				
1	9.64	9.50																				
	28.94	28.70																				
2	2.36	2.40																				
	31.30	31.10																				
3	2.32	2.33																				
	33.62	33.43																				
4	2.58	2.42																				
	36.20	35.85																				
5	2.17	2.14							40.3	*41.4*	40.4	38.5	39.7	36.3	40.22	40.01						
	38.37	37.99							4.2	1.6	3.6	5.0	2.3	3.7	43.00	42.90						
6	2.10	2.32							44.5	43.0	44.0	43.5	42.0	39.0	45.41	45.17	47.6				45.7	45.1
	40.47	40.31							3.2	4.5	1.1	2.3	3.1	5.0								
6½															46.66	46.31	49.6				46.9	46.2
7	2.15	1.90							47.7	47.5	45.1	*45.8*	45.1	44.0	47.95	47.24					47.5	*47.6*
	42.62	42.21							.5	1.0	2.4	1.5	1.7	1.5								
7½															48.31	48.26					49.2	48.4
8	2.18	1.89							48.2	*48.5*	47.5	47.3	46.8	45.5	49.48	49.35	51.1	47.83			50.3	49.2
	44.80	44.10							2.5	2.4	2.3	1.7	2.5	.9								
8½															49.56	50.39	52.2	49.21			51.5	49.7
9	1.78	1.65							50.7	*50.9*	49.8	49.0	49.3	46.4	51.36	51.10	53.4	50.00		49.33	51.6	51.5
	46.58	45.75							.9	.7	1.2	1.3	—.9	1.9						50.31		
9½															52.19	*52.00*	54.3				52.7	51.5
10	1.73	1.65		48.88	49.08		49.80		51.6	51.6	51.0	50.3	48.4	48.3	53.66	53.33	54.8	50.98	52.57	51.36	53.5	53.0
	48.31	47.40		.66	1.66		1.94		2.1	1.2	2.4	.8	2.8	1.5								
10½															54.75	54.05		51.96	53.23	*52.52*	54.7	54.2
11	1.69	2.16		49.54	50.74		51.74		53.7	52.8	53.4	51.1	51.2	49.8	55.34	55.16	57.3	53.43	54.26	*53.62*	54.7	*55.1*
	50.00	49.56		1.94	2.60		2.50		2.1	2.9	1.3	4.0	..5	.9								
11½															56.71	*56.92*	58.7	54.72	54.84	*54.92*	55.9	*56.6*
12	1.46	2.52		51.48	53.44		54.24		55.8	55.7	54.7	*55.1*	51.7	50.7	57.17	*57.70*	60.0	55.66	55.70	*56.30*	57.1	*57.4*
	51.46	*52.08*		.98	.86		1.02		1.6	3.1	2.0	2.1	3.6	4.3								
12½															57.75	*59.33*	61.3		57.09	*57.75*	57.9	*58.1*

13.	1.77 53.23	2.64 *54.72*	57.87 2.03	52.46	54.20		55.26		57.4 2.2	*58.8* .4	56.7 2.2	*57.2* .2	55.3 .7	55.0 .3	58.23	*59.48*	61.3	58.73	58.07	*58.62*	*59.0*	*60.2*
13½.															59.48 61.02	*60.59* *61.33*	65.6 66.8	59.96 61.98	60.11 62.49	59.74 60.60	59.8	*60.9*
14.	2.48 55.71	1.66 *56.88*	59.90 1.79						59.6 2.6	59.2 1.5	58.9 1.8	57.4 1.2	56.0 2.2	55.3 1.2							60.9	*61.8*
14½.															62.17 63.71	*62.48* 62.60	68.6 68.6	62.48 62.83	63.98 65.31	60.75 61.78	62.6	62.0
15.	1.87 57.58	.58 56.96	61.69 .91						62.2 1.4	60.7 .5	60.7 1.7	58.6 .7	58.2 .8	56.5 .8							64.5	62.6
15½.															65.12 65.68	63.26 63.00	68.6	63.54 63.58	65.87	61.80 61.80	64.7	62.6
16.			62.60 .39						63.6 1.2	61.2 0.0	62.4 .7	59.3 —.2	59.0 2.6	57.3 1.3							65.7	62.9
16½.															67.36 67.46	63.70 63.42		63.62 63.62.		61.80	65.5	63.0
17.			62.99						64.8 .4	61.2 — .4	63.1 1.0	59.1 .9	61.6 .2	58.6 —1.5							66.5	62.9
17½.															67.45 67.48	63.90 64.00		64.11			66.5	63.7
18.									65.2 3.2	60.8 .5	64.1 .1	60.0 —1.1	61.8 — .3	57.1 1.6							66.5	63.8
19.									68.4 —2.4	61.3 .3	64.2 .9	58.9 2.4	61.5 1.8	58.7 — .4								
20.									66.0 — .8	61.6 .4	65.1 0.0	61.3 — .8	63.3 .4	58.3 — .4								
21.									65.2 .9	62.0 — .1	65.1 — .4	60.5 .1	63.7 — .4	57.9 1.7								
22.									66.1 — .8	61.9 .7	64.7 0.0	60.6 — .6	63.3 — .2	59.6 .1								
23.									65.3 .9	62.6 — .1	64.7 — .2	60.0 .5	63.1 .2	59.7 — .7								
24.									66.2 —1.3	62.5 —1.2	64.5 — .2	60.5 — .4	63.3 — .8	59.0 .4								
25.									64.9 .5	61.3 — .5	64.3 .9	60.1 1.2	62.5 1.8	59.4 —1.7								
26.									65.4 1.6	60.8 — .2	65.2 — .3	61.3 —1.3	64.3 —1.0	57.7 2.3								
27.									67.0 —1.9	60.6 1.2	64.9 — .5	60.0 .9	63.3 .6	60.0 —3.0								
28.									65.1 .9	61.8 .2	64.4 — .9	60.9 —1.4	63.9 .5	57.0 1.3								
29.									66.0 —1.7	62.0 .1	63.5 .3	59.5 1.9	64.4 — .7	58.3 — .5								
30.									64.3 1.5	62.1 — .2	63.8 1.0	61.4 —1.6	63.7 — .1	57.8 1.5								
31.									65.8	61.9	64.8	59.8	63.6	59.3								

TABLE 34.—*Weight and increments, in pounds, according to various measurements.*[1]

Ages in years.	112		113		114		115		116		117		118		119		120		121		122	
	Boyd, 1861, London.		Quetelet, 1836, Belgium, selected (10 M., 10 F.).		Bowditch, 1875, Boston (13,691 M., 10,904 F.).		Roberts, 1878, England.														Bowditch, 1878, foreign.	
							Artisan class (13,931).		Favored classes (7,709).		All classes.		Towns (2,568).		Soldiers, policemen, etc. (29,531).		Feeble-minded (829).		Town boys (7,855).			
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0	5.06	4.25	6.8	6.6							7.1	6.9										
1	1 to 2 yrs.		15.0	12.4																		
			21.8	19.0																		
			2.5	5.3																		
2	14.31	13.13	24.3	24.3							32.5											
			3.3	3.0							1.5											
3	3 to 4 yrs.		27.6	27.3							34.0	31.9										
			3.3	3.3							3.3	3.6										
4	20.00	18.47	30.9	30.6			41.2				37.3	35.5					35.0					
			4.2	3.1			8.8				2.6	4.1					4.0					
5	5 to 6 yrs.		35.1	33.7	41.1	39.7	50.0				39.9	39.6			37.31		39.0					
			4.1	3.1	4.1	3.6	4.2				4.5	2.8			3.36		4.0					
6	25.50	24.56	39.2	36.8	45.2	43.3	54.2				44.4	42.4			40.67		43.0					
			4.2	2.4	3.9	4.2	2.7				5.3	4.3			4.66		3.5					
7			43.4	39.2	49.1	47.5	56.9				49.7	46.7	54.83		45.33		46.5					
			4.2	2.7	4.8	4.5	2.1				5.2	5.5	5.17		3.45		4.0					
8			47.6	41.9	53.9	52.0	59.0				54.9	52.2	60.00		48.78		50.5					
			4.2	4.4	5.3	5.1	3.6				5.5	3.3	2.02		4.78		2.0					
9	7 to 13 yrs.		51.8	46.3	59.2	57.1	62.6				60.4	55.5	62.02		53.56		52.5					
			3.8	4.6	6.1	5.3	3.7				7.1	6.5	4.32		2.92		6.5					
10	42.31	38.31	55.6	50.9	65.3	62.4	66.3		67.4		67.5	62.0	66.34		56.48		59.0				70.6	
			3.9	5.3	4.9	6.4	3.2		5.5		4.5	6.1	3.32		2.71		5.5				4.7	
11			59.5	56.2	70.2	68.8	69.5		72.9		72.0	68.1	69.66		59.19		64.5		66.31		75.3	
			4.4	7.7	6.7	9.5	4.2		7.4		4.7	8.3	5.46		3.83		6.0		3.15		10.6	
12			63.9	63.9	76.9	*78.3*	73.7		80.3		76.7	76.4	75.12		63.02		70.5		69.46		85.9	
			9.1	7.8	7.9	9.4	4.6		8.3		5.9	10.6	6.82		7.80		6.5		4.22		8.5	
13			73.0	71.7	84.8	*88.7*	78.3		88.6		82.6	*87.0*	81.94		70.82		77.0		73.68		94.4	
			8.8	8.3	10.1	9.7	6.3		10.6		9.4	9.7	10.30		10.75		8.5		4.59		5.5	
14			81.8	80.0	94.9	*98.4*	84.6		99.2		92.0	*96.7*	92.24		80.57		85.5		78.27		99.9	
			9.0	8.2	12.2	7.7	12.2		11.2		10.7	8.1	13.06		15.34		9.0		3.34		16.7	
15	14 to 19 yrs.		90.8	88.2	107.1	106.1	96.8		110.4		102.7	*104.8*	105.30		95.91		94.5		81.61		116.6	
			9.3	7.7	13.9	5.9	11.9		17.9		16.3	7.9	13.45		14.89		8.5		15.18		9.2	
16	68.00	63.90	100.1	95.9	121.0	112.0	108.7		128.3		119.0	112.7	118.75		110.80		103.0		96.79		125.8	

			9.5	7.3	6.5	3.5	7.7		12.7		11.9	2.2	8.75		13.21		7.0		11.91		9.4	
17.			109.6	103.2	127.5	115.5	116.4		141.0		130.9	114.9	127.50		124.01		110.0		108.70		135.2	
			9.2	6.6	5.1	-.3	6.9		5.0		6.5	2.8	12.50		5.42		6.0		7.70		3.0	
18.			118.8	109.8	132.6	115.2	123.3		146.0		137.4	117.7	140.00		129.43		116.0		116.40		138.2	
			8.2	5.1			5.1		2.3		2.2	6.0	1.16		4.08		4.5		6.90			
19.			127.0	114.9			128.4		148.3		139.6	123.7	141.16		133.51		120.5		123.30			
			4.2	2.4			2.2		3.7		3.7	-.5			2.98		1.0		5.10			
20.			131.2	117.3			130.6		152.0		143.3	123.2			136.49		121.5		128.40			
									.3		1.9	-2.0			1.43		.5		2.20			
21.									152.3		145.2	121.2			137.92		122.0		130.60			
									2.4		1.7	3.0			1.27		.5					
22.									154.7		146.9	124.2			139.19		122.5					
											.9	2.2										
23.											147.8	126.4										
	20 to 29 yrs.										.2	-5.8										
24.	90.91	80.81									148.0	120.6										
											1.2											
25.											149.2											
											2.5											
26.											151.7											
											.6											
27.											152.3				141.10		123.0					
											1.6											
28.											153.9											
											.3											
29.											154.2											
											5.6											
30.											159.8											
33.	(2)																					
34.																						
35.											164.3											
36.													162.10		138.27							
40.											163.1											
42.																						
43.																						
46.											166.1											
47.																						
48.											158.1											
49.																						
50.											182.1											
51.																						
52.																						
53.																						

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[1] The references for weight are the same as for height except as indicated.

[2] According to Boyd, in 1861, London, weights were, for ages 30 to 39 years, males 98.22 pounds, females, 87; 40 to 50 years, males 102, females 84.58; 50 to 60 years, males 102.08, females 86; 60 to 70 years, males 103.81, females 86.90; 70 to 80 years, males 106.81, females 80.25; 80 to 90 years, males 99, females 79.03.

TABLE 34.—*Weight and increments, in pounds, according to various measurements*—Continued.

Ages in years.	123		124		125		126		127		128		129		130		131		132		133	
	British Anthrop. Com., 1880, England, public schools, military and naval colleges (29,405).		Peckham, 1881, Milwaukee (4,773 M., 4,891 F.).		Hertel, 1882, Denmark (17,134 M., 11,250 F.).		Peckham, 1882, America, children (228).		British, report, 1883, English (first 4 years from Holt).		Shuttleworth, 1884, England.				Daffner, 1885, Germany (700).		Greenwood, 1886, American, white (743).		Greenwood, 1886, American, negro (723).		Michailoff, 1887, Russia, Dorfschüler.[1]	
											General population.		Idiots and imbeciles (1,209).									
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0	......	......	......	......	......	......	......	......	7.5	7.2	......	......	......	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	13.0	12.6	......	......	......	......	......	......	......	......	......	......	......	......
1	......	......	......	......	......	......	......	......	20.5	19.8	......	......	......	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	6.0	5.7	......	......	......	......	......	......	......	......	......	......	......	......
2	......	......	......	......	......	......	24.39	23.11	26.5	25.5	......	......	......	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	5.99	6.19	4.7	4.5	......	......	......	......	......	......	......	......	......	......	......	......
3	......	......	......	......	......	......	30.38	29.30	31.2	30.0	......	......	......	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	4.62	3.87	3.8	4.0	......	......	......	......	......	......	......	......	......	......	......	......
4	......	......	38.8	36.3	......	......	35.00	33.17	35.0	34.0	......	......	......	......	......	......	......	......	......	......	......	......
	......	......	2.3	3.7	......	......	......	......	6.2	5.2	......	......	......	......	......	......	......	......	......	......	......	......
5	......	......	41.1	40.0	......	......	......	......	40.0	39.2	......	39.2	39.0	37.5	......	......	......	......	......	......	......	......
	......	......	3.7	3.1	......	......	......	......	4.4	2.5	......	2.5	4.0	3.5	......	......	......	......	......	......	......	......
6	......	......	44.8	43.1	46.3	44.1	......	......	44.4	41.7	......	41.7	43.0	41.0	......	......	......	......	......	......	......	......
	......	......	4.3	3.9	3.3	3.3	......	......	5.3	5.8	......	5.8	3.5	4.0	......	......	......	......	......	......	......	......
7	......	......	49.1	47.0	49.6	47.4	......	......	49.7	47.5	......	47.5	46.5	45.0	......	......	......	......	......	......	......	......
	......	......	4.7	3.9	3.3	4.4	......	......	5.2	4.6	......	4.6	4.0	4.0	......	......	......	......	......	......	......	......
8	......	......	53.8	50.9	52.9	51.8	......	......	54.9	52.1	55.0	52.1	50.5	49.0	......	......	......	......	......	......	48.94	46.96
	......	......	5.7	5.5	4.4	4.4	......	......	5.5	3.4	5.0	3.4	5.0	4.0	......	......	......	......	......	......	2.65	4.19
9	......	......	59.5	56.4	57.3	56.2	......	......	60.4	55.5	60.0	55.5	55.5	53.0	......	......	......	......	......	......	51.59	51.15
	......	......	5.9	6.0	5.5	5.5	......	......	7.1	6.5	5.0	7.4	3.5	6.0	......	......	......	......	......	......	5.51	3.97
10	73.97	......	65.4	62.4	62.8	61.7	......	......	67.5	62.0	65.0	62.9	59.0	59.0	......	......	......	......	......	......	57.10	55.12
	4.75	......	5.5	6.4	5.5	5.5	......	......	4.5	6.0	5.0	5.2	5.5	7.0	......	......	......	......	......	......	5.29	4.62
11	78.72	......	70.9	68.8	68.3	67.2	......	......	72.0	68.0	70.0	68.1	64.5	*66.0*	......	......	66.35	63.9	68.7	64.2	62.39	59.74
	6.19	......	5.2	9.0	5.6	7.8	......	......	4.7	8.4	7.5	8.3	6.0	6.0	......	......	6.85	6.6	2.8	14.8	3.30	3.97
12	84.91	......	76.1	*77.8*	73.9	*75.0*	......	......	76.7	76.4	77.5	76.4	70.5	*72.0*	......	......	73.20	70.5	71.5	*79.0*	65.69	63.71
	6.66	......	8.8	10.2	6.6	8.8	......	......	5.9	10.8	7.5	10.8	6.5	8.0	......	......	8.05	7.7	16.0	11.0	3.97	6.61
13	91.57	......	84.9	*88.0*	80.5	*83.8*	......	......	82.6	*87.2*	85.0	*87.2*	77.0	*80.0*	76.15	......	81.25	78.2	87.5	*90.0*	69.66	*70.32*
	10.58	......	10.9	9.6	8.8	8.8	......	......	9.4	9.5	7.5	9.5	8.5	8.0	7.77	......	5.95	11.9	4.9	9.0	......	......
14	102.15	......	95.8	*97.6*	89.3	*92.6*	......	......	92.0	*96.7*	92.5	*96.7*	85.5	*88.0*	83.92	......	87.2	*90.1*	92.4	*99.0*	......	......
	12.17	......	13.2	8.3	13.3	10.0	......	......	10.7	9.3	10.0	9.6	9.0	7.0	12.28	......	5.0	11.1	5.9	2.6	......	......
15	114.32	......	109.0	105.9	102.6	102.6	......	......	102.7	*106.0*	102.5	*106.3*	94.5	*95.0*	96.20	......	92.2	*101.2*	98.3	*101.6*	......	......

16	15.16	......	13.1	4.7	14.2	9.8	......	......	16.3	6.1	15.0	6.8	8.5	7.0	4.18	......	15.1	6.0	11.5	5.7	......	......
	129.48	......	122.1	110.6	116.8	112.4	......	......	119.0	113.1	117.5	113.1	103.0	102.0	100.38	......	107.3	107.2	109.8	107.3	......	......
17	12.18	......	8.3	2.7	10.0	......	......	......	11.0	2.9	17.5	2.4	7.0	4.0	6.50	......	......	......	......	......	......	......
	141.66	......	130.4	113.3	126.8	......	......	......	130.0	115.0	135.0	115.5	110.0	106.0	106.88	......	......	......	......	......	......	......
18	4.78	......	7.4	—.8	7.7	......	......	......	7.4	5.1	7.5	5.6	6.0	4.0	17.58	......	......	......	......	......	......	......
	146.44	......	137.8	112.5	134.5	......	......	......	137.4	121.1	142.5	121.1	116.0	108.0	124.46	......	......	......	......	......	......	......
19	2.02	......	......	......	......	......	......	......	2.2	2.7	1.2	2.7	4.5	4.5	—1.99	......	......	......	......	......	......	......
	148.46	......	......	......	......	......	......	......	139.6	123.8	143.7	123.8	120.5	108.5	122.47	......	......	......	......	......	......	......
20	3.90	......	......	......	......	......	......	......	3.7	—.4	1.3	—.4	1.0	0.0	3.11	......	......	......	......	......	......	......
	152.36	......	......	......	......	......	......	......	143.3	123.4	145.0	123.4	121.5	108.5	125.58	......	......	......	......	......	......	......
21	.36	......	......	......	......	......	......	......	1.9	—1.6	1.2	—1.6	.5	......	.54	......	......	......	......	......	......	......
	152.72	......	......	......	......	......	......	......	145.2	121.8	146.2	121.8	122.0	......	126.12	......	......	......	......	......	......	......
22	.03	......	......	......	......	......	......	......	......	......	1.3	1.6	.5	......	19.88	......	......	......	......	......	......	......
	152.75	......	......	......	......	......	......	......	......	......	147.5	123.4	122.5	......	146.00	......	......	......	......	......	......	......
23	......	......	......	......	......	......	......	......	......	......	1.2	.7	......	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	......	......	148.7	124.1	......	......	......	......	......	......	......	......	......	......
24	......	......	......	......	......	......	......	......	......	......	1.3	—3.3	......	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	......	......	150.0	120.8	......	......	......	......	......	......	......	......	......	......
28	......	......	......	......	......	......	......	......	......	......	151.2	120.0	123.0	109.0	......	......	......	......	......	......	......	......
36	......	......	......	......	......	......	......	......	......	......	152.5	120.8	......	......	......	......	......	......	......	......	......	......
46	......	......	......	......	......	......	......	......	......	......	155.0	118.6	......	......	......	......	......	......	......	......	......	......
48	......	......	......	......	......	......	......	......	......	......	157.5	104.0	......	......	......	......	......	......	......	......	......	......

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[1] One-half year should be added to the ages given for the measurements in this column.

TABLE 34.—*Weight and increments, in pounds, according to various measurements*—Continued.

Ages in years.	134		135		136		137		138		139		140		141		142		143		144	
	Michailoff, 1887, Russia, stadtschüler.[1]		Cordeiro, 1887, U. S. Navy (4,812).		Suligowski, 1887, Radom (1,133).[1]		Stevenson, 1888.		Geissler, 1888, Gohlis (1,386 M., 1,420 F.).[1]		Erisman, 1888, Moscow (2,453 M., 1,495 F.).		Key, 1889, Sweden (15,000 M., 3,000 F.).		Hrdlička, 1899, Italian children.		Hrdlička, 1899, whites and blacks.		Key, 1889, Sweden, mittelschulen.		Key, 1889, Sweden, volksschulen.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
5							40.49	39.63									33.00	34.00				
							4.30	3.21									7.00	6.00				
6							44.79	42.84	47.2	45.2	44.1	42.8	45.2		38.80	39.00	40.00	40.00	45.19	45.63	48.06	45.41
							4.60	4.24	3.3	4.2	4.4	4.2	5.1		5.90	2.30	5.00	2.00	5.07	1.99	1.54	3.53
7							49.39	47.08	50.5	49.4	48.5	47.0	50.3	47.6	44.70	41.30	45.00	42.00	50.26	47.62	49.60	48.94
							5.02	5.04	4.0	4.6	4.6	1.5	7.5	7.5	1.50	1.70	2.00	3.00	7.50	7.50	7.28	2.21
8	48.50	46.96			55.3		54.41	52.12	54.5	54.0	53.1	48.5	57.8	55.1	46.20	43.00	47.00	45.00	57.76	55.12	56.88	51.15
	4.63	1.54			6.5		5.41	4.16	4.4	3.8	8.0	7.9	6.8	4.2	6.80	8.00	6.00	7.00	6.83	4.18	1.10	5.07
9	53.13	48.50			61.8		59.82	56.28	58.9	57.8	61.1	56.4	64.6	59.3	53.00	51.00	53.00	52.00	64.59	59.30	57.98	56.22
	7.93	7.94			6.2		6.58	5.89	4.6	5.0	6.1	4.0	2.2	5.5	3.30	6.50	4.00	8.00	0.0	5.51	5.29	5.51
10	61.06	56.44			68.0		66.40	62.17	63.5	62.8	67.2	60.4	66.8	64.8	56.30	*57.50*	57.00	*60.00*	64.59	*64.81*	63.27	61.73
	6.18	3.74			5.4		4.69	6.30	7.0	6.9	6.2	6.4	4.2	5.5	5.50	7.80	7.00	5.00	6.40	5.51	10.80	5.51
11	67.24	60.18			73.4		71.09	68.47	70.5	69.7	73.4	66.8	71.0	70.3	61.80	*65.30*	64.00	*65.00*	70.99	70.32	74.07	67.24
	6.17	6.62			8.7		5.72	8.88	5.8	8.1	9.5	13.7	5.1	8.8	7.10	6.80	6.00	7.00	5.07	8.82	−1.32	7.49
12	73.41	66.80			82.1		76.81	*77.35*	76.3	*77.8*	82.9	80.5	76.1	*79.1*	68.90	*72.10*	70.00	*72.00*	76.06	*79.14*	72.75	*74.73*
	9.48	13.67			9.8		6.91	10.47	3.1	7.3	8.6	8.8	6.8	8.2	3.10	6.90	11.00	12.00	6.83	8.16	6.62	8.38
13	82.89	80.47			91.9		83.72	*87.82*	79.4	*85.1*	91.5	89.3	82.9	*87.3*	72.00	*79.00*	81.00	*84.00*	82.89	*87.30*	79.37	*83.11*
	8.60	8.81			11.7		9.74	9.74			11.2	5.1	10.4	11.5	13.00	23.00	3.00	13.00	10.36	11.46	2.20	7.94
14	91.49	89.28	86.11		103.6		93.46	*97.56*			102.7	94.4	93.3	*98.8*	85.00	*102.00*	84.00	*97.00*	93.25	*98.76*	81.57	*91.05*
	11.24	4.63	10.23		8.9		11.44	7.88			14.1	5.5	9.9	9.0	−9.00		1.00	15.00	22.05	9.04	16.09	10.36
15	102.73	93.91	96.34		112.5		104.90	*105.44*			116.8	99.9	103.2	*107.8*	76.00		85.00	*112.00*	115.30	107.80	97.66	*101.41*
	14.11		13.21		10.9		15.10	6.92			9.8	1.1	12.1	6.0			30.00	2.00				
16	116.84		109.55		123.4		120.00	112.36			126.6	101.0	115.3	113.8			115.00	114.00				
			10.60		3.4		9.19	2.85			132.5		11.7	6.6			7.00					
17			120.15		126.8		129.19	115.21					127.0	120.4			122.00					
					.4		5.78	1.22					8.1	3.7								
18					127.2		134.97	116.43					135.1	124.1				104.00				
					3.5								4.5	2.5								
19					130.7								139.6	126.6								
					6.2								4.1	.6								
20					136.9								143.7	127.2								
21																						

Ages in years.	145		146		147		148		149		150		151		152		153		154		155	
	Axel Key, 1889, Sweden, volksschüler.[1]		Simon, 1889, French (223).		Greenwood, 1890, American, white (2,055).		Greenwood, 1890, foreign (385).		Pagliani, 1890, Turin (1,048 M., 968 F.).		Stevenson, 1890, England, nonlaboring.		Stevenson, 1890, England, laboring.		Hasse, 1891, Germany, II Burgerschule.[1]		Hasse, 1891, Germany, I Burgerschule.[1]		Barnes, 1892, Oakland, Cal.		Schmidt, 1892, Saalfeld (4,000 M., (4,807 F.).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
3.									27.3	24.7												
									2.5	4.2												
4.									29.8	28.9												
									3.7	4.2												
5.									33.5	33.1												
									3.3	3.1												
6.									36.8	36.2									47.0	45.9	41.9	40.1
									6.0	2.8									3.2	2.2	4.8	4.7
7.									42.8	39.0									50.2	*48.1*	46.7	44.8
									2.8	2.9									4.0	4.1	4.4	3.7
8.	56.88	51.15	44.09						45.6	41.9					53.57	52.47	55.56	54.23	54.2	*52.2*	51.1	48.5
	1.10	5.07	2.21						3.8	6.4					3.97	4.41	5.94	5.51	5.4	6.4	4.7	5.3
9.	57.98	56.22	46.30						49.4	48.3					57.54	56.88	61.50	*59.74*	59.6	*58.6*	55.8	53.8
	5.29	5.51	12.12						5.3	6.2					4.63	5.29	1.33	3.09	7.1	4.6	2.8	4.8
10.	63.27	61.73	58.42						54.7	54.5	67		66		62.17	62.17	62.83	62.83	66.7	63.2	58.6	58.6
	10.80	5.51	1.10						3.9	4.8	6		4		5.29	6.17	6.83	9.26	5.3	6.5	7.1	6.4
11.	74.07	67.24	59.52		67.50	65.92		63.77	58.6	*59.3*	73		70		67.46	*68.34*	69.66	*72.09*	72.0	*69.7*	65.7	65.0
	−1.32	7.49	11.03		3.46	.28		6.81	6.0	5.7	7		4		7.94	8.16	8.16	8.38	5.9	9.2	5.3	7.1
12.	72.75	*74.73*	70.55		70.96	66.20	76.75	70.58	64.6	*65.0*	80		74		75.40	*76.50*	77.82	*80.47*	77.9	*78.9*	71.0	*72.1*
	6.62	8.38	2.20		7.32	14.44	.73	16.08	8.2	11.1	8		4		3.30	7.28	2.43	8.15	11.5	1.8	6.2	8.6
13.	79.37	*83.11*	72.75		78.28	*80.64*	77.48	*86.66*	72.8	*76.1*	88		78		78.70	*83.78*	80.25	*88.62*	89.4	*90.7*	77.2	*80.7*
	2.20	7.94	10.02		9.17	11.08	13.98	13.34	7.9	8.8	10		6		6.84	9.25	10.36	9.26	7.6	7.5	2.6	
14.	81.57	*91.05*	82.77		87.45	*91.72*	91.46	*100.00*	80.7	*84.9*	98		84		85.54	*93.03*	90.61	*97.88*	97.0	*98.2*	79.8	
			9.82		6.00	8.38	14.65	4.77	11.5	11.7	12		10						11.1	10.7		
15.			92.59		93.45	*100.10*	106.11	104.77	92.2	*96.6*	110		94						108.1	*108.9*		
			13.23		17.82	11.06	.89	5.39	11.9	4.2	16		12						13.5	.9		
16.			105.82		111.27	111.16	107.00	*110.16*	104.1	100.8	126		106						121.6	109.8		
					7.73	5.95			12.1	3.9	14		10						10.1	7.9		
17.					119.00	117.11			116.2	104.7	140		116						131.7	117.7		
					7.60	1.81			2.4	2.4	6		6						6.0	.6		
18.			112.44		126.60	118.92			118.6	107.1	146		122						137.7	118.3		
					10.23	1.33			2.7		2		6									
19.					136.83	120.25			121.3		148		128									
											2		4									
20.											150		132									
											2		4									
21.			117.94								152		136									

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[1] One-half year should be added to the ages given for the measurements in this column.

[2] [illegible]

TABLE 34.—*Weight and increments, in pounds, according to various measurements*—Continued.

Ages in years.	156		157		158		159		160		161		162		163		164		165		166		167	
	Hastings, 1893, American, Amherst College (1,321).		Hastings, 1893, American, Amherst College (2,106).		Hanna, 1893, Oberlin (500 students) half-year measurements.		Hanna, 1893, Oberlin (1,600 students) half-year measurements.		Porter, 1893; St. Louis (16,295 M., 18,059 F.).		Miwa, 1893, Japan (1,250 M., 2,800 F.).		Sack, 1893, Russia, gymnasien.[1]		Kosmowsky, 1894, Russia, ferien-kolonien.[1]		West, 1894, Worcester (3,250).		Porter, 1894, St. Louis (15,325 M., 16,112 F.).		Beyer, 1895, American naval cadets (4,537).		Hall, 1895, Pennsylvania (2,434).	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
3											31.0	29.6												
4											2.0	3.0												
											33.0	32.6												
5											3.1	1.7												
											36.1	34.3					42.63	39.36						
6											1.8	2.7					3.41	4.34						
									43.7	41.7	37.9	37.0					46.04	43.70	43.55	41.74				
7									4.1	4.2	4.0	2.4					3.33	4.26	4.23	4.17				
									47.8	45.9	41.9	39.4					49.37	47.96	47.78	45.91				
8									4.7	4.6	2.8	3.8					4.27	3.64	6.65	4.54				
									52.5	50.5	44.7	43.2	52.03		49.82	46.30	53.64	51.50	52.43	50.45				
9									5.0	4.8	4.6	4.9	6.83		2.65	2.86	6.17	5.87	5.03	4.85				
									57.5	55.3	49.3	48.1	58.86		52.47	49.16	59.81	57.37	57.46	55.30			58.4	
10									4.9	5.3	3.3	4.3	4.30		4.85	5.29	6.70	6.15	4.99	5.32			7.7	
									62.4	60.6	52.6	52.4	63.16		57.32	54.45	66.51	63.52	62.45	60.62			66.1	
11									5.9	6.0	4.6	5.2	5.51		5.07	4.85	4.49	6.42	5.91	5.86			5.6	
									68.3	66.6	57.2	*57.6*	68.67		62.39	59.30	71.00	69.94	68.36	66.48			71.7	
12									5.6	7.7	4.9	8.6	6.29		5.95	8.16	7.75	9.80	5.53	7.74			8.8	
									73.9	*74.3*	62.1	*66.2*	74.96		68.34	67.46	78.75	*79.74*	73.89	*74.22*			80.5	
13									6.8	10.6	10.0	7.1	7.67		2.21	3.53	7.38	7.92	6.83	10.65			9.2	
									80.7	*84.9*	72.1	*73.3*	82.63		70.55	*70.99*	86.13	*87.66*	80.72	*84.87*			89.7	
14									8.4	8.4	11.3	12.3	14.18		10.14	13.01	2.05	11.44	8.45	8.38			9.9	
									89.1	*93.3*	83.4	*85.6*	96.81		80.69	*84.00*	98.18	*99.10*	89.17	*93.25*			99.6	
15									11.8	9.7	15.8	5.3	11.66				14.02	5.90	12.75	9.70			9.1	
						87.54		86.8	101.9	*103.0*	99.2	90.9	108.47				112.20	105.00	101.92	*102.95*	107		108.7	
16						83.79			11.9	7.9	.9	2.4	9.91				11.40	4.00	11.76	7.85	11		17.0	
						91.51		89.3	113.8	110.9	100.1	93.3	118.38				123.60	109.00	113.68	110.80	118		125.7	
17						99.22		94.6	9.0	5.1	9.4	6.3					9.30	6.00	9.07	5.21	7		8.1	
	131.82		131.99			96.36		97.7	122.8	116.0	109.5	99.6					132.90	115.00	122.75	116.01	125		133.8	
18	1.43		2.08			101.65		100.3		−0.5	8.8	1.2					.30	5.00	.55	−.56	8.4		4.9	
	133.25		134.07			104.30		104.3		115.5	108.3	100.8					133.20	120.00	123.30	115.45	133.4		138.7	
19	2.19		1.77			106.50		106.0		−.4	3.8	−1.3					9.40	−1.70		−.37	6.3		2.0	
	135.44		135.84			110.25		110.2		115.1	112.1	99.5					142.60	118.30		115.08	139.7		140.7	

																				115.08	139.7		140.7	
20.	2.67		2.28			114.00		112.4		3.7	−.2	1.8						[illegible]		2.79	[illegible]		[illegible]	
	138.11		138.12			116.20		116.1		118.8	111.9	101.3						116.80		118.87	141.9		142.6	
21.	1.42		1.88			119.95		117.9			.6										−1.2		2.6	
	139.53		140.00			123.38					112.5										140		145.1	
22.	1.32		1.07			125.24		123.0													1.3			
	140.85		141.07					125.6													141.3			
23.	−.17		.14																		2.7			
	140.68		141.21			127.67		128.9													144			
24.	1.57		1.21			131.86																		
	142.25		142.42			135.61		133.9																
25.	2.78		2.70																					
	145.03		145.12																					
26.	−.77		−.21																					
	144.26		144.91					141.5																
27.	−.35		−.51			142.00																		
	143.91		144.40					144.8																
28.	−2.78		−3.69																					
	141.13		140.71			149.28																		
29.	1.55		1.97																					
	142.68		142.68																					
30.	3.82		3.82																					
	146.50		146.50																					
31.						150.20																		
32.								156.5																

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[1] One-half year should be added to the ages given for the measurements in this column.

TABLE 34.—*Weight and increments, in pounds, according to various measurements*—Continued.

Ages in years.	168		169		170		171		172		173		174		175		176		177		178		179	
	Gilbert, 1894, New Haven (50 M., 50 F.).		Gilbert, 1897, Iowa (50 M., 50 F.).		Boas, 1897, California (1,903 M., 2,304 F.).		Boas, 1897, (2,109 M., 1,716 F.).		MacDonald,[1] Washington, D. C. (7,953 white M., 8,520 F.).		Vahl, 1884, Denmark.		Smedley, 1900, Chicago (2,788 M., 3,471 F.).		Hastings, 1902 (5,476 M.).		Hastings, 1902, Nebraska (7,700 M., 7,069 F.).		Rietz, 1903, Berlin, gymnasium (1,740 M., 533 F.).		Rietz, 1903, Berlin, gemeidschulen (1,496 M., 1,365 F.).		Hoesch Ernst, 1906, Switzerland.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
3												32.3												
												3.5												
4												35.8												
												3.7												
5									45.2	43.3		39.5			39.29		39.29	38.10						
									2.6	2.4		2.1			3.33		3.32	2.60						
6	46.8	44.3	45.9	41.6	47.7	45.7	45.7	43.8	47.8	45.7		41.6	43.52	41.61	42.62		42.61	40.70	49.50	49.06	44.22	43.12		
	4.4	6.1	5.5	5.8	4.0	3.9	4.0	4.1	3.7	3.7		6.8	45.59	43.93	4.23		4.25	4.84	3.96	3.08	3.30	4.40		
7	51.2	50.4	51.4	47.4	51.7	49.6	49.7	47.9	51.5	49.4		48.4	47.66	46.25	46.85		46.86	45.54	53.46	52.34	47.52	47.52		
	1.3	2.6	3.6	3.6	5.6	6.1	4.4	4.0	4.7	4.3		5.2	49.72	48.57	4.05		4.04	3.23	3.96	5.50	3.74	3.74		
8	52.5	53.0	55.0	51.0	57.3	55.7	54.1	51.9	56.2	53.7		53.6	52.52	50.74	50.90		50.90	48.77	57.42	*57.64*	51.26	51.26		
	7.5	5.8	6.6	7.1	4.4	4.3	5.3	6.1	5.3	4.8		5.4	55.31	52.91	4.25		4.25	6.01	3.74	3.52	5.28	3.08	49.65	48.71
9	60.0	58.8	61.6	58.1	62.2	60.0	59.4	58.0	61.5	58.5		59.0	58.07	55.69	55.15		55.15	54.78	61.16	61.16	56.54	54.34	0	.50
	8.4	3.9	2.1	4.0	6.8	6.8	6.4	6.1	4.7	5.7		5.9	60.83	58.48	6.13		6.12	4.97	9.46	6.16	4.18	6.16	49.65	49.21
10	68.4	62.7	63.7	62.1	69.0	66.8	65.8	64.1	66.2	*64.2*		64.9	63.30	61.29	61.28		61.27	59.75	70.62	67.32	60.72	60.50	2.00	3.40
	2.4	7.3	8.7	7.1	5.8	7.5	5.5	5.9	6.5	9.0		9.1	65.76	64.10	3.61		4.42	4.05	5.06	8.50	5.28	6.16	51.65	*52.61*
11	70.8	70.0	72.4	69.2	74.8	74.3	71.3	70.0	72.7	*73.2*		74.0	68.85	67.61	64.89		65.69	63.80	75.68	75.82	66.00	*66.66*	1.30	1.37
	11.5	14.5	5.8	10.5	6.8	9.9	7.1	11.0	6.7	8.6		6.6	71.92	71.12	7.66		6.86	8.93	13.42	8.80	6.38	9.02	52.95	*53.98*
12	82.3	*84.5*	78.2	*79.7*	81.6	*84.2*	78.4	*81.0*	79.4	*81.8*		80.6	75.30	*75.79*	72.55		72.55	*72.73*	89.10	83.62	72.38	*75.68*	1.69	1.13
	5.7	7.5	11.7	14.4	7.5	10.0	8.5	8.7	8.9	11.2		9.2	78.68	*80.47*	5.77		5.77	10.74	5.72	9.90	7.92	10.78	54.64	*55.11*
13	88.0	*92.0*	90.9	*94.1*	89.1	*94.2*	86.9	*89.7*	88.3	*93.0*		89.8	83.98	*85.94*	78.32		78.32	*83.47*	94.82	91.52	80.30	*86.46*	1.94	3.31
	3.7	6.0	11.1	5.8	16.0	11.6	11.3	10.9	12.6	7.4		11.5	89.27	*97.41*	9.09		9.08	10.95	15.52	9.90	2.20	8.36	56.58	*58.42*
14	91.7	*98.0*	102.0	99.9	105.1	*105.8*	98.2	*100.6*	100.9	100.4		101.3	94.14	*97.50*	87.41		87.40	*94.42*	110.34	101.42	82.50	*94.82*	.63	.75
	18.3	6.0	15.0	11.4	14.4	4.9	15.6	5.6	12.8	4.8		7.3	99.02	*103.60*	15.88		15.89	8.34	2.30	12.32			57.21	*59.17*
15	110.0	104.0	117.0	111.3	119.5	110.7	113.8	106.2	113.7	105.2		108.6	105.82	*106.90*	103.29		103.29	102.76	112.64	*113.74*				
	17.0	9.0	13.0	.3		5.8	8.8	2.5	7.5	4.8		−7.7	112.63	108.79	13.09		13.09	8.08		10.12				
16	127.0	113.0	130.0	111.6		116.5	122.6	108.7	121.2	110.0		100.9	117.39	111.69	116.38		116.38	110.84		123.86				
	3.0	.7	10.1	9.4		.9	10.1	5.9	10.8	1.5			122.15	114.58			8.62	−.13		6.16				
17	130.0	113.7	140.1	121.0		117.4	132.7	114.6	132.0	111.5			126.53	115.51			125.00	110.97		130.02				

18.			2.5	4.5					.2				130.91	116.44			5.35	−.62		11.66				
			142.6	125.5					132.2				135.14	116.70			130.35	110.35		141.68				
19.			2.9	.9									139.36	116.95			5.41	2.80		2.42				
			145.5	126.4													135.76	113.15		144.10				
20.																	−1.36	1.84						
																	134.40	114.99						
21.																								

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[1] See MacDonald, second reference.

TABLE 34.—*Weight and increments, in pounds, according to various measurements*—Continued.

Ages, in years.	180		181		182		183		184		185		186		187	
	Hoesch, Ernst, 1906, Switzerland, Volkschüler (175 M., 175 F.).		Bobbitt, 1909, Philippines (1,180 M., 428 F.).		Bobbitt, 1909, China (60).		Wisawa, 1909, Japan (9,609 M., 7,466 F.).		Wisawa, 1901, Japan (869,014).		Wisawa, 1909, Japan.		Baldwin, 1910, Chicago (460 M., 638 F.).		Weissenberg, 1911, poor.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0							6.69	6.32								
1							13.15 19.84	12.42 18.74								
2							3.97 23.81	3.07 21.82								
3							3.52 27.33	3.53 25.35								
4							2.87 30.20	3.08 28.43								
5							3.31 33.51	3.53 31.96								
6			39.69				2.86 36.37	3.31 35.27					47.0	43.6		
6½													51.0	46.8		
7			1.76 41.45	40.90			2.87 39.24	2.65 37.92	38.80	36.81			49.6	48.2		
7½													56.2	49.0		
8			3.31 44.76	3.86 44.76			2.87 42.11	3.30 41.22	3.31 42.11	4.41 41.22			57.2	51.3		
8½	54.45	52.47											60.0	55.6		
9			2.21 46.97	5.51 *50.27*	54.46		4.19 46.30	3.97 45.19	4.41 46.52	2.87 44.09			58.6	58.1		
9½	55.80	53.80											62.5	59.3		
10			3.75 50.72	.89 *51.16*	1.11 55.57		4.41 50.71	3.97 49.16	3.74 50.26	4.19 48.28			67.2	65.5	57.21	
10½	60.18	66.60											68.8	65.8		
11			6.17 56.89	7.27 *58.43*	3.97 59.54		4.41 55.12	4.63 53.79	4.86 55.12	5.73 54.01			71.1	66.8	2.29 59.50	
11½	66.14	69.00											72.7	72.5		
12			5.73 62.62	7.28 *65.71*	7.49 67.03		4.84 59.96	7.49 *61.28*	4.40 59.52	5.07 59.08			76.8	75.3	4.50 64.00	
12½	71.21	71.43											77.8	*83.0*		
13			5.96 68.58	8.16 *73.87*	7.06 74.09		5.73 65.69	7.94 *69.22*	5.29 64.81	7.28 *66.36*	83.30		86.0	*94.8*	7.06 71.06	
13½	79.81	85.98											87.0	*95.0*		

14.			8.[illegible] 77.40	6.61 80.48	8.31 77.40		8.88 74.07	11.25 80.47	6.64 71.65	7.40 78.85	9.40 92.70		96.1	*109.0*		
14½.	83.11	91.05											102.5	*108.8*		
15.			13.89 91.29	7.72 88.20	22.49 99.89		11.25 85.82	8.75 84.22	5.95 77.60	6.40 80.85	11.70 104.40		107.5	*112.0*		
15½.													108.5	*111.8*		
16.			8.82 100.11	3.53 91.73					6.62 84.22	7.27 87.58	8.08 112.48		112.0	108.8		
16½.													114.5	112.5		
17.			2.53 102.64	3.97 95.70							2.89 115.37		124.7	113.2		
17½.													128.5	110.5		
18.			5.18 107.82	1.32 97.02									130.5	115.7		
19.			5.08 112.90	−2.65 94.37												
20.			.88 113.78	−.66 93.71												
21.			−.66 113.12													

TABLE 34.—*Weight and increments, in pounds, according to various measurements*—Continued.

Ages, in years.	188		189		190		191		192		193		194		195	
	Weissenberg, 1911.				Goddard, 1912, Vineland, N. J.						Baldwin, 1913, Chicago and New York (100 M., 100 F.).		Baldwin, 1913, American, F. W. Parker School, Chicago (1 M., 1 F.).		Baldwin, 1913, American, Friends' School, Washington (1 M., 1 F.).	
	Middle.		Wealthy.		Moron (1,274 M., 1,410 F.).		Imbecile (3,187 M., 2,767 F.).		Idiot (1,436 M., 1,025 F.).							
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
5					39.3	43.3	38.8	38.5	35.2	33.9	38.1	37.9				
					6.4	.6	4.5	4.9	3.9	.7	41.0	40.1				
6					45.7	43.9	43.3	43.4	39.1	34.6	42.9	41.7	50.7			
					−12.2	4.4	4.7	4.2	6.7	8.6	44.8	44.2	52.9			
7					33.5	48.3	48.0	47.6	45.8	43.2	46.9	48.1				
					22.3	7.7	4.0	4.6	5.6	5.0	51.3	50.4				
8					55.8	*56.0*	52.0	*52.2*	51.4	48.2	54.2	54.7	54.5	50.7		
					4.8	2.7	6.3	6.3	4.1	3.6	55.9	*57.1*	56.3	52.9		
9					59.6	58.7	58.3	*58.5*	55.5	51.8	60.4	57.5	59.1	57.5		49.60
					4.2	8.3	.1	6.1	2.3	3.7	62.1	61.5	60.2			54.67
10	56.64		57.76		63.8	*67.0*	63.4	*64.*	57.8	55.5	66.9	64.8	63.9	61.51	62.17	56.22
	3.52		2.38		8.3	5.3	8.8	6.2	6.4	8.8	71.4	68.4		63.00	62.83	59.52
11	60.16		60.14		71.1	*72.3*	72.2	70.8	64.2	*64.3*	73.5	71.7	73.0	68.30	69.00	59.92
	7.63		10.33		8.7	9.6	1.3	7.0	−.3	8.8	75.5	74.9	80.0	72.75	69.44	66.20
12	67.79		70.47		79.8	*81.9*	73.5	*77.8*	63.9	*73.1*	81.0	*82.8*	81.5	79.80	71.65	71.65
	5.71		6.12		8.1	2.8	10.5	10.3	10.8	6.0	84.6	*91.5*	86.5		76.72	*78.48*
13	73.50		76.59		87.9	84.7	84.0	*88.1*	74.7	*79.1*	89.5	*91.8*		94.55	81.57	*82.01*
					8.1	20.1	8.5	11.4	8.8	4.7	87.7	*96.4*	87.5	*107.75*	91.71	*91.93*
14					96.0	*104.8*	92.5	*99.5*	83.5	*83.8*	94.9	*102.3*	101.5	*113.75*	100.31	97.00
					11.7	8.7	10.3	4.7	3.9	9.9	98.9	105.8	109.5	*126.50*	108.25	100.53
15					107.7	*113.5*	102.8	*104.2*	87.4	*93.7*	104.9	*110.3*	121.0	*123.75*	113.98	102.96
					9.1	−5.6	6.4	3.5	11.2	1.3	115.9	115.3	136.0	132.25	119.27	108.03
16					116.8	107.9	109.2	107.7	98.6	95.0	118.9	113.6		136.25		111.77
					12.5	11.6	6.5	4.1	9.9	7.3	127.1	116.9		140.00		110.23
17					129.3	119.5	115.7	111.8	108.5	102.3	128.5	117.9		148.00		
					2.1	−4.1	8.5	.0	.6	−2.0	127.0	119.0				
18					131.4	115.4	124.2	111.8	109.1	100.3	129.0	117.0		150.05		
					6.2	6.0	−1.1	.7	.3	7.3						
19					137.6	121.4	123.1	112.5	109.4	107.6						
					.8	−2.1	6.4	4.6	12.6	−3.8						
20					138.4	119.3	129.5	117.1	122.0	103.8						
					.6	2.6	2.3	−4.1	2.0	8.1						
21					139.0	121.9	131.8	113.0	124.0	111.9						

22					−2.2 136.8	.6 122.5	−2.0 129.8	2.0 115.0	−7.1 116.9	−2.0 109.						
23					−.6 130.2	.7 123.2	−.4 129.4	−.4 114.6	3.0 119.0	1. 110.						
24					6.5 142.7	3.8 127.0	5.1 134.5	1.1 115.7	6.0 125.0	[illegible] 110.0						
25					−3.9 130.5	−5.0 122.0	.5 134.0	10.9 126.9	−9.0 116.0	[illegible] 109.[illegible]						
26					−2.1 137.4	−7.5 114.5	2.9 136.9	−2.4 123.5	12.4 128.4	[illegible] 109.[illegible]						
27					6.0 143.4	9.5 124.0	−1.8 134.4	−7.5 116.0	[illegible] [illegible]	[illegible] 116.[illegible]						
28					−2.7 140.7	.4 124.4	1.8 136.9	1.5 117.5	[illegible] [illegible]	[illegible] [illegible]						
29					−2.4 138.3	[illegible] 127.2	−2.8 133.4	[illegible] 120.0	[illegible] [illegible]	[illegible] [illegible]						
30					−1.2 137.1	[illegible] 117.0	−1.1 132.3	[illegible] 115.0	[illegible] 94.[illegible]	[illegible] [illegible]						
31					6.4 143.5	[illegible] 120.0	5.2 137.5	[illegible] 118.[illegible]	[illegible] 120.0	[illegible] 115.[illegible]						

V. BIBLIOGRAPHY OF EXPERIMENTAL STUDIES IN PHYSICAL GROWTH (336 TITLES).

Abbot, S. W. The evidence of stillbirth. *In* Massachusetts medico-legal society. Transactions. Boston, 1879. v. 1. p. 56.

A discussion containing some indirect references to physical development.

Adams, A. L. On the physical requirements of soldiers. British and foreign medical chirurgical review, 55 : 202–17 (1875).

Aitken, W. On the growth of the recruit and the young soldier. London, 1862. 72 p.

A preliminary study of the British soldier.

Angerstein, W. Die massverhältnisse des menschlichen körpers und das wachstum der knaben. Köln, 1865. 10 p.

Anutschin, ——. On the geographical distribution of the male population of Russia in respect of height. Imperial geographical society. Transactions. v. 7. part 1.

Russian, cited by Sack.

Audran, Gerhard. Les proportions du corps humain mesurées sur les belles figures de l'antiquité. Paris, 1683. 26 p.

An excellent study with diagrams and measurements of twenty-five famous statues.

Baldwin, B. T. Individual differences in the correlations of physical growth of elementary and high school pupils. Journal of educational psychology, 2 : 150–52 (1911).

Abstract. A preliminary report of the beginnings of the investigation included in this bulletin.

Balliet, T. M. Results from study of bodily growth. School journal, N. Y., 60:47 (1900).

A brief discussion on physical development.

Barnes, Earl. Physical development of Oakland children. Oakland school report (1892–93). p. 38–44.

A study of the physical development of about 6,000 Oakland school children, with charts and tables showing height, weight, and age and the occupations and nationalities of the children. The children from Oakland were heavier and taller than the children from Boston, Worcester, Toronto, St. Louis, and Milwaukee, whose records were displayed at the World's Fair in Chicago in 1892.

Baudrand, M. L'accroisement; ses caractères normaux et anormaux chez la nourrison: ses rapports avec l'hérédité, plus spécialement dans les états morbides (syphilis, alcolisme et tuberculose). Paris, Doin et fils, 1911. 648 p.

The table is explanatory of the contents of this important book.

Baxter, J. H. Statistics, medical and anthropological, of the Provost general's bureau. Washington, 1875. v. 1.

This is an important comparative study, showing that the size of adult Americans is very different in different states of the Union, and even in different parts of the same state. There is apparently an influence of climate upon growth.

Beard, G. M. English and American physique. North American review, 4 : 588–603 (1879).

This article discusses almost everything except the physical characteristics of the two peoples.

Beddoe, ——. On the physical characteristics of the Jews. *In* Ethnological society, London. Transactions, 1861. v. 1. p. 223.

A study included primarily for its historical significance.

——— On the stature and bulk of man in the British Isles. *In* Anthropological society, London. Memoirs, 1870. v. 3. p. 545.

A pioneer study of physical development.

Belyaieff, ——. Materials for investigating the influence of schools on the physical development of pupils. Inaugural dissertation. St. Petersburg, 1888.

Russian, cited by Sack.

Contains suggestive data for educational inferences.

Bernard, P. Considérations médico-légales sur la taille et le poids depuis la nassaince jusqu' à l'âge adulte. Archiv. d'anthrop. criminelle, 2:213–25 (1887).

Contains many good statistics on growth and includes the data from Buffon, Ziessing, Quetelet, Pagliani, and Bowditch. Also from Gerhardt.

Bertillon, A. Les proportions du corps humain. Revue scientifique, Paris, 43 : 524–29 (1889).

An important anthropometric contribution for recording comparative measurements of individuals.

Beyer, H. G. Growth of United States naval cadets. *In* U. S. Naval institute. Proceedings, 1895. v. 21. p. 297–333.

A simple presentation of methods of computing physical measurements, the application of percentile grades, and a series of 48 tables.

——— The influence of exercise on growth. American physical education review, 1:76–87 (1896).

——— Observations on normal growth and development under systematized exercises. Report of Chief of Bureau of medicine and surgery to the Secretary of the Navy. Washington, 1893. p. 149–60.

——— Relation between physical and mental work. American physical education review, 5 : 149–60 (1900).

Confirms all of the important results of Porter's researches on "Precocity and dullness," suggests a change in the physical examinations in public schools, and advocates the use of the percentile grade tables in Massachusetts.

Bird, Frederick. Über die relativen massverhältnisse des menschlichen körpers. Zsch. f. anthrop., Leipzig (1823). p. 330–69.

Blagovidoff, I. Materials for the investigation of the health of the Mongolian-Asiatic races (inorodze) in the province of Simbrisk. Inaugural dissertation. St. Petersburg, 1886.

Russian, cited by Sack. Not accessible to the printer.

Boas, F. Anthropological investigations in schools. Pedagogical seminary, 1:225–28 (1891).

A general discussion, with many historical references as to methods of procedure.

——— The correlation of anatomical or physiological measurements. American anthropologist, 7:313–24 (1894).

A discussion of the theory of measurements based on measurements of the heads of 377 half-blood Indians.

——— The forms of the head as influenced by growth. Science, n. s., 4:50–51 (1896).

——— Growth. *In* Monroe's Cyclopedia of education. New York, Macmillan, 1912. v. 3. p. 187–90.

An excellent summary of the relation of physical growth to the general problem of education, with tables giving stature, sitting height, weight, length of head, width of head, length of forearm, and width of hand for boys and girls.

——— Growth of children. Science, 20 : 351–52 (1892).

——— ——— Science, n. s., 5:570–73 (1897).

In this investigation in Worcester the same children were measured twice (May, 1891, and May, 1892). The average increase in stature between 6 and 7, 7 and 8, 8 and 9, 9 and 10, 10 and 11, 11 and 12, 12 and 13, 13 and 14, 14 and 15, 15 and 16 are included for tall boys and short boys and for tall girls and for short girls. Young children grow more uniformly than older children and growth is more variable with girls than with boys. Short children continue to grow longer than tall children.

——— ——— Science, 36 : 815–18 (1912).

——— Growth of Toronto children. *In* British association for the advancement of science. Report, 1897. v. 6. p. 443–49.

——— ——— *In* U. S. Bureau of education. Report of the Commissioner for the year, 1896–97. v. 2. p. 1541–99.

See also British association for the advancement of science. Report, 1897. p. 443–49.

——— The measurements of variable quantities. New York, Science press, 1906. (Columbia university contributions to philosophy and psychology. v. 14. p. 1–50).

A detailed technical discussion on constants and variables; a comparison between limited series of observations and the unlimited series of variables and the distribution of variables and of chance variations.

Boas, F. On the growth of first-born children. Science, n. s., 1:402–4 (1895).

This article contains four very valuable tables on the height and weight and yearly increments of boys and girls between 6½ and 17½ years of age. The study includes the first, second, third, fourth, and later born children. The conclusions are that in stature and weight the first born children exceed the later born children. This study includes Toronto and Oakland children; the latter exceed all others in the United States (at this time) in height and weight.

——— On Dr. Townsend Porter's investigations of the growth of the school children of St. Louis. Science, n. s., 1:225–30 (1895).

——— Physical characteristics of the Indians of the North Pacific coast. American anthropologist, 4 : 25–32 (1891).

Studies based on measurements of 263 Indians from Oregon, Washington, and British Columbia, including stature, sitting height, cephalic index, length of arm, etc.

——— Physical characteristics of the tribes of the North Pacific coast. *In* British association for the advancement of science, 1891. v. 61. p. 424–47.

A detailed study of 26 measurements on a number of individual male and female Indians. No averages are given.

——— Summary of the work of the committee in British Columbia. *In* British association for the advancement of science, 1898. v. 68. p. 667–83.

A summary of the measurements on the Indians of the North Pacific coast, containing 12 extensive tables for 19 measurements on males from 5 to 70 years old.

——— *and* Wisler, Clark. Statistics of growth. *In* U. S. Bureau of education. Report of the Commissioner for the year, 1904. v. 1. p. 25–132.

Bobbitt, J. F. The growth of Philippine children. Pedagogical seminary, 16:3–34 (1909).

A study of the measurements of 1,180 native Filipino boys and 438 girls between the ages of 6 and 20 years, together with a discussion of growth stages and a comparison with the Smedley and Boas norms. A comparison is also made of the growth of the Filipino children with the growth of Japanese children as given by Dr. Misawa.

Boulton, ——. Some anthropometrical observations. British medical journal (1876). p. 280–82.

A brief article of historical value, primarily for the method involved.

Bowditch, H. P. The growth of children. *In* Massachusetts. Board of health. 8th annual report. Boston, 1875. p. 273–323.

The data for this investigation were collected from 24,500 children in the public schools of Boston and near-by communities and a few private schools. A comparative study is made of the growth in height and weight and the tables are arranged in such a way that the influence on growth by nationality may be determined.

——— Growth of children. *In* Massachusetts. Board of health. 10th annual report. Boston, 1879. v. 10. p. 33–62.

This investigation is supplementary to the previous one and contains 11 tables and 11 plates. The tables give the parentage and then the occupations of parents in professional, mercantile, and unskilled labor classes.

——— The growth of children studied by Galton's percentile grades. *In* Massachusetts. Board of health. 22d annual report. Boston, 1891. v. 22. p. 479–525.

Abstract contained in American association for the advancement of physical education, 1891. v. 6, p. 36–37.

Applying this method to 24,000 Boston school children Dr. Bowditch concludes: I. The period of accelerated growth in height and weight occurs just before the age of puberty. Large children have their period of accelerated growth at an earlier age than small ones. II. The period when the girls are taller and heavier than the boys occurs earlier in the higher than in the lower percentile grades. "In other words, during the period of female superiority tall girls surpass tall boys in height less than short girls surpass short boys, while heavy girls exceed heavy boys in weight more than light girls exceed light boys."

——— The physique of women in Massachusetts. *In* Massachusetts. Board of health. Report. Boston, 1890. v. 21. p. 287–304.

——— The relation between growth and disease. *In* American medical association, Philadelphia. Transactions, 1881. v. 32. p. 370–76.

This is a valuable discussion based on the thesis that "It seems probable that the actual determination of the normal rate of growth will not only throw light upon the nature of the diseases to which childhood is subject, but will also guide us in the application of therapeutic measures."

An individual study of the rate of growth of one girl between the ages of two and three years is included, based on 26 measurements in weight with accompanying health notes from four observations.

Boyd, Robett. Table of weights of the human body and internal organs in the sane and insane, etc. Phil. Trans., London, 151:241–62 (1861).

This table includes ages from before birth to 80 years and the results show that the body and internal organs arrive at full size in both sexes between twenty and thirty years of age. "The average height of the adult male varied from 67.8 to 65 inches, and of the female from 63.2 to 61.6 inches, while the mean weight of the former varied from 112.12 to 91.5 pounds, as compared with the sane adults dying at the same period of life.

Brent, W. B. On the stature and relative proportions of man at different epochs and in different countries. *In* British association for the advancement of science, September, 1844.

An abstract of paper giving measurements out of 1,000 individuals. The average height of English men is placed at 5 ft. 7½ inches.

——— Tables illustrative of the height, weight and strength of man. *In* British association for the advancement of science, 1845. v. 15. p. 80–81.

In these tables men are grouped as tall, middle height, and short. Of 100 Englishmen of all classes 4 are very tall, 6 feet 3 inches; 26 are tall, 5 feet 9 inches to 6 feet; 40 are of middle height, 5 feet 9 inches; 26 are short, 5 feet 3 inches to 5 feet 6 inches; and 4 are very short, 5 feet to 5 feet 3 inches.

Breslau, ——. Neue ergebnisse aus schädelmessung an neugeborenen. Wiener medicinische wochenschrift, 50:785–87 (1862).

Brown, C. R. Anthropometric notes on the inhabitants of Clara Island, Ireland. *In* British association for the advancement of science, 1897. v. 67. p. 510–11.

A study of the average height of 56 adult males giving an average of 66.75 in.

Brunniche, A. Ein beitrag zur beurteilung der körperentwicklung der kinder. Jahrb. für kinderkrankheiten, 47:1–28 (1866).

Bryan, E. B. Nascent stages and their pedagogical significance. Pedagogical seminary, 7:357–96 (1900).

This is one of the most important articles on physical growth from the standpoint of periods of development. The author bases his conclusions on the work of thirty-seven different writers. After outlining the periods of childhood as differentiated by Hartwell, Lange, Zeissing and others, he finds there are three periods: Infancy, childhood and youth. Each of these stages is discussed from the scientific and pedagogical points of view.

Burgerstein, Leo, *and others*. Schulhygiene. Jena, Fisher, 1902. p. 473–485.

A good summary of anthropometric work with references to American studies, including tables and curves. A short bibliography is included.

Burk, F. Growth of children in height and weight. American journal of psychology, 9:253–326.

This is the most general contribution to the subject of physical growth up to the year 1898. Most of the significant contributions previous to this are discussed and a number of tables included. Probably the most important single discussion is the series of norms derived from a comparative study of the work of Boas, Bowditch, Porter and others.

——— Influence of exercise upon growth. *In* National education association of the United States. Journal of proceedings and addresses, 1899. p. 1067–76.

A good general account of the effect of physical exercise on growth.

——— The influence of sex upon growth. American physical education review, 4:340–49 (1899).

The conclusions of this report emphasize the fact that exercise should follow racial habit as far as possible.

Camerer, W. Bermerkungen über wachstum. Zsch. für biologie (1880). p. 24–28.

A short, detailed study of infant growth which was reprinted in the article which follows.

——— Untersuchungen über massenwachstum und langenwachstum. Jahrb. für kinderheilkunde, 36:249–93 (1893).

Carmon, W. B. Causes of some rapid changes in body weight. Journal of the American medical association, 59:725–71 (1912).

A brief discussion of theoretical value.

Cattell, J., *and* Farrand, L. Physical and mental measurements of the students of Columbia university. Psychological review, 3:618–48 (1896).

A detailed and important study of mental tests and physical characteristics with some suggestions on anthropometric measurements.

Chaille, S. E. Infants: their chronological progress. New Orleans medical and surgical journal, 14:893–912 (1886–87).

This report contains a few measurements and many suggestions for observation.

Chamberlain, A. F. The child. New York, Scribner, 1900. p. 51–106.

A general discussion of the problem of physical growth from the anthropological and educational standpoints.

Christopher, W. S. Measurements of Chicago children. Journal of the American medical association, Chicago, 35:618–23; 683–87.

This is a detailed illustrated report of the work done at Chicago by Smedley, Campbell, McMillan, and others in the Chicago public schools. The charts and graphs are included in the report of Mr. Smedley, which is noted further along in this bibliography.

In the second part of this report Dr. Christopher says: "As a result of his examination of 33,500 school children in St. Louis, in 1892, Dr. W. Townsend Porter concluded that there is a physical basis of precocity; that dull children are lighter and precocious children heavier than the average child; that mediocrity of mind is associated with mediocrity of physique At the outset of my investigations I determined to reinvestigate Porter's proposition, and have to say that such facts as we have been able to collect go to confirm it."

Combe, J. Körperlänge und wachstum der volksschulkinder in Lausanne. Zsch. für schulgesundheitspflege, 9:569–89 (1896).

During the seven years of Dr. Combe's investigation 2,000 children were measured, giving a sum total of 13,358 measurements. The value of individual measurements is discussed, and also the relation of disease to growth in height at different ages with reference to time of birth in the year, and to parentage.

Cordeira, F. J. B. A contribution to anthropometry. New York medical journal, 45:484–87 (1887).

An illustrated article showing the method of computing height and weight curves, with a number of conclusions and criticisms bearing on the work of other investigators, together with some data on the average maximum and minimum measurements for height, weight, chest, and chest expansion between the ages of 14 and 18 for sailors on the *Minnesota*.

Crampton, C. W. Anatomical or physiological age: *versus* chronological age. Pedagogical seminary, 15:230–37 (1908).

A general discussion of the previous work done in this field by the writer and a recommendation that "All observations, records, and investigations of children, whether pedagogical or medical, social or ethical, must regard physiological age as a primary and fundamental basis."

——— Influence of physical age on scholarship. Psychological clinic, 1:115–20 (1908).

In this article Dr. Crampton discusses the relation of physiological age, as determined by pubescence and height, to scholarship. The tables are confined to boys (?) between the ages of 12 and 17 years. The conclusions are that "Earlier pubescence favors good scholarship; later pubescence poor scholarship."

——— Physiological age. American physical education review, 13:144–54; 214–27; 268–83; 345–58.

The best study so far made on the age of puberty of boys. The age at which this usually takes place is from 13.5 to 14.5. "Individuals differ from each other in weight (and height) according to their maturity." There is, according to these results, no marked primary relation between scholarship and weight, height, strength, etc.

Crichton-Browne, *Sir* J. Growth—somatic and cerebral. Child study, 4:77–91 (1911).

A good general discussion without detailed anthropometric measurements.

Daffner, F. Über grösse, gewicht, kopf und brustumfang beim männlichen individuum vom 13 bis 22 lebensjahre. Archiv für anthrop. (beilage), 15:121–26 (1884).

Supplementary to the following study but confined to males and including chest circumference. A small number of individuals is included; each year from 13 to 22 are taken up separately.

——— Vergleichende untersuchungen über die entwicklung der körpergrösse und kopfumfanges. Archiv für anthrop., 15:37–44 (1884).

A good discussion of the subject, including many tables.

——— Das wachstum des menschen. Anthropologische studien. Leipzig, W. Englemann, 1902. 475 p.

A good study of growth of different parts of the body, starting with the embryo and including puberty.

Data on measurements of 6,000 California school children as to weight and measurement. *In* Oakland, Cal. School report, 1892–93.

See Barnes.

Debusk, B. W. Height, weight, vital capacity, and retardation. Pedagogical seminary, 20:89–92 (1913).

A brief preliminary study of physical development.

Dickson, S. H. Some additional statistics of height and weight. Charleston medical journal and review, 13:494–506 (1858).

In this report a comparison is made between the heights and weights of Americans of different nationalities with the stature and weight of Europeans. Results are based on students of the Medical college of South Carolina, the University of Louisiana, the University of Tennessee, Jefferson college, Virginia military institute, the Military academy at West Point, and the University of Michigan. Conclusions show that Europeans increase more in weight than Americans as they grow older. The Americans have on the average greater height.

——— Statistics of height and weight in the South. Charleston medical journal and review, 12:607–13 (1857).

Dr. Dickson has collected in this report some detailed statistics in regard to the average height and weight of Southern men. A careful study is made of the different nationalities, of students and recruits with the conclusion that on the average men from the Atlantic Southern States are not so tall as those from Kentucky, Tennessee, and Virginia, although the two tallest men in the army in 1857 were from Georgia and South Carolina respectively.

——— Statistics of height and weight. American journal of medical sciences, Philadelphia (1866). 52:373–380.

This report shows that the new American race, which is growing out of an almost unlimited mixture of other races, exhibits thus far no deterioration, but compares favorably with all the races of the Old World in every point of physical development. The whole number of individuals (286 young men from Jefferson college) average 24 years of age, 5 feet 9½ inches in height, and 147 pounds in weight. Kentuckians were the tallest people, who average 5 feet 11 inches, one being 6 feet 6 inches.

Diek, ——. Materali k izsledovaniyi roste, viesa, okruzhnosti grundi i zhiznennoo yomkosti lishkickh detskavo i yunoshesk. Voyenno-med. journal, St. Petersburg, 146:223–363 (1883).

A report of the stature, weight, and vital capacity of children in Russia. An inaugural dissertation given in St. Petersburg, cited by Sack.

Donaldson, H. H. A comparison of the white rat with man in respect to the growth of the entire body. Lancaster, Pa., New Era co., 1906. p. 26.

Reprinted.

A very important comparison between the growth in body-weight of the rat for 365 days, and of man from birth to 23 years of age, the latter being based on Robert's tables. The conclusions reached are that "the increase in body weight of the man and the white rat between conception and maturity exhibit similar phases, five in number." The growth of the female in relation to that of the male is similar in both forms, as are also the relative weights of the two sexes at maturity.

——— Growth of the brain. London, 1896. 369 pp.

Chapters 2 and 3 are very good on the general problem of physical growth.

Drummond, W. B. Introduction to child study. London, 1907. p. 93–138.

A general treatment of growth for the first four years; quotes Holt extensively.

Dudrewicz, L. Pomiary antropolog. dzieci Warszawskich. Zboir. wiad. do antrop. . . . Akad. Umiej. w Krakow, 6:3–23 (1882).

Anthropological measurements of children in Warsaw.

Dun, W. A. The police standard of Cincinnati; with some statistics compiled from the first thousand examinations of applicants. Lancet-clinic, Cincinnati, O., 18:131–35, 767–76 (1887).

Contains many valuable tables for comparative study on minimum height and weight requirements.

Elliott, E. B. On the military statistics of the United States of America. U. S. Sanitary commission, Berlin, 1863. v. 4. p. 44.

Reprinted.

A comparative study of the heights, weights, etc., of Soldiers in the Army of the Potomac.

Ellis, H. Man and woman. London, 1896. p. 31–114.

Also published by Scribner, New York, 1904. p. 32–54.

In chapter 3 of this book there is a good discussion of the growth and proportions of the body. A number of references are given and four charts from Key showing the relative increments of growth in height and weight from 7 to 20 years of age. The relative proportions of different parts of the body of man and woman are compared.

Elson, J. C. Statistics regarding short-course students. American physical education review, 15:348–49 (1910).

A brief article which shows that in a study of 8,000 college students the short course men (men who are taking special courses in agriculture) surpass in all measurements, except height, the men of the present freshmen class.

Enebuske, C. J. Some measurable results of Swedish pedagogical gymnastics. *In* American association for the advancement of physical education, 1892. v. 7. p. 207–55.

A report of observations made by M. Aura Wood on 26 students of the Boston Normal school of gymnastics. Eight tables are included and a plea is made for casuistic study in place of isolated statistical measurements.

Engelsperger, A., *and* Ziegler, O. Beiträge zur kenntnis der physischen natur des sechsjährigen in die schule eintretenden kindes. Anthropometrisches teil. Epd. 1: 173–235 (1905).

Erismann, F. Schulhygiene auf der jubilaumsausstellung der gesellschaft für beforderung der arbeitsamkeit in Moskau. Zsch. für schulgesundheitspflege, 1:367–73; 393–419 (1888).

The latter part of this report gives comparative tables with discussions on the height and weight of about 3,000 boys and 1,500 girls in the schools of the city of Moscow, and 4,300 boys and 700 girls in the nearby village schools.

——— Untersuchungen über die körperliche entwicklung der arbeiterbevölkerung in Zentralrussland. Tübingen, 1889.

Reprinted from Archiv für soziale gesetzgebung und statistik.

The latter part of this report deals primarily with hygiene and gives the results of the measurements of 24,288 boys and 16,032 girls ranging from 7 to 18 years, taken from city schools, village schools, and factories.

——— Untersuchungen über die körperliche entwicklung der fabrikarbeiter in Zentralrussland (1888).

Manuscript.

Ernst, L. H., *and* Meumann, E. Das schulkind in seiner körperlichen und geistigen entwicklung. Leipzig, Otto Nemnich, 1906. p. 143.

This book contains a fairly complete summary of the previous investigations upon physical growth and development, and a series of charts which gives the growth curves as found by the different investigators. The author's own work consists in an extensive study of something over 300 Munich children, with regard not only to height and weight but also lung capacity, span, and various girths. These figures are presented in detailed tables and the author's conclusions are compared with those of previous investigators.

Farr, W. Table showing the relative stature of boys at the age 11 to 12, under different conditions of life. *In* British association for the advancement of science, 1880. v. 1. p. 128–59.

A report of the committee of the Association, appointed originally in 1875, for the purpose of continuing the collection of observations on the systematic examination of heights, weights, etc., of the human frame in the British Empire, and the publication of photographs of the typical races of the Empire. In 1879, 46 different classes of subjects were included, giving a sum total of 11,745 individuals, while in the 1880 study one class of subjects was included, or 11,956 individuals. There are several excellent distribution tables giving the mean measurements for boys and men between 10 and 50 years, there being in all three charts (plates) and 27 tables. This is a valuable and suggestive report.

Fergus, W., *and* Rodwell, G. F. On a series of measurements for statistical purposes, recently made at Marlborough college. Journal of Anthropological institute of Great Britain and Ireland, London, 5:126–30 (1874).

A short study of the college student.

Fleischmann, L. Über ernährung und körperwägungen der neugeborenen und säuglinge. Wien, 1877. 48p.

Reprint from Wien-klinik.

A very good study of infancy.

Forbes, H. O. On the Kubers of Sumatra. Journal of the Anthropological institute, 14:121–128 (1884–85).

A careful study of 12 Kubers from the central part of Sumatra, including detailed measurements.

Foster, A. B. Report of director of physical training. American physical education review, 3:44–53 (1898).

Reprinted from the annual report of the president of Bryn Mawr college, containing measurements on freshmen, sophomores, juniors, and seniors, and discussing various kinds of physical exercise.

Foster, W. L. Physiological age as a basis for classification of pupils entering high schools, and relation of pubescence to height. Psychological clinic, 4:83–88 (1910–11).

A study of the physiological age of 459 boys with the conclusions that there is a close relationship between height and pubescence, and that a classification of high-school students according to physiological age, based upon pubescence, is easy and practical.

French, M. S. Report of the physical examination of men upon the police force of Philadelphia, and those who were applicants for appointment. Philadelphia, 1885.

Galton, F. An anthropometrical laboratory. Journal of the Anthropological institute, 14:205–21 (1884–85).

A description of the anthropometrical laboratory, which aimed to show to the public the simplicity of the instruments and methods by which the chief physical characteristics may be measured and recorded.

——— Anthropometric percentiles. Nature, 31: 223 (1884–85).

In this article Dr. Galton gives a percentile table of the persons measured in the anthropometric laboratory at the late international health exhibit. The table is given primarily as a sample of the statistical method, and secondarily for its intrinsic value. There were in all 9,337 persons measured between the ages of 23 and 50.

——— Family likeness in stature. Royal society. Proceedings. London, 1886. v. 40. p. 42–73.

A detailed statistical study showing the correlation between the probable stature of a child when the statures of several of his kinsmen are known. The Appendix by Dr. Dixon gives eight tables showing the relation of the adult children to the mid-parents.

——— Hereditary stature. Journal of the Anthropological institute of Great Britain and Ireland, 14:488–99 (1885–86).

——— On the height and weight of boys, aged 14 years, in town and county public schools. Journal of the Anthropological institute of Great Britain and Ireland, London, 5:174–80 (1815–16).

Comparisons are made between 509 city boys, 296 country boys and others ranging from 10 to 17 years of age; it is found that the country boys are about 1½ inches taller and 7 pounds heavier than the city boys.

——— Range in the height of males at each age and in several classes. British association for the advancement of science. Report, 1881. v. 51. p. 250–54.

——— Report of the Anthropometric committee. *In* British association for the advancement of science, 1883.

This is the final report of the committee appointed in 1875 and includes valuable data on the growth of boys and girls at birth and during subsequent ages, including adult life. While this report deals with adults primarily, the height and weight at birth of 451 boys and 466 girls are included.

——— Some results of the anthropometrical laboratory. Journal of the Anthropological institute, 14:275–88 (1884–85).

The results of measurements on 9,337 persons, 4,726 adult males and 1,657 adult females. Percentile tables are given.

——— Useful anthropometry. *In* American association for the advancement of physical education, 6:51–57 (1891).

A discussion on the means of investigating the best method of assigning marks for physical efficiency based on anthropometric tests. A study of 2,000 students at Cambridge revealed conclusively, according to Dr. Galton's observations, that success in the literary examinations is in no manner connected with stature, weight, strength, or breathing capacity, and but slightly with keenness of eyesight.

Ganjoux, ———. Annales de médecine et chirurgie. Paris, 1910. p. 725–60.

Garson, ———. Report of the committee appointed for the purpose of calculating the anthropological measurements taken at the Newcastle meeting of the association in 1889. *In* British association for the advancement of science. Report. London, 1890. v. 60. p. 549–52.

Geissler, A. Messungen von schulkindern in Gholis-Leipzig. Zsch. für schulgesundheitspflege, 5:249–53 (1892).

A supplementary consideration of the greater height of the favored classes, based on new data which consists of the measurements of 2,806 children at the end of the summer vacation in 1889.

Geissler, A., *and* Uhlitzsch, R. Die grössenverhältnisse der schulkinder in schulinspektionsbezirk Freiburg. Zsch. des königlichen sächsischen statistischen bureaus, 34:28–40 (1888).

This investigation was begun in 1866 for the purpose of fitting school desks, and is a comparative study of the boys and girls of the Freiburg burger schulen and of those of the peasant classes in nearby communities. 21,173 children were in the schools, ranging from 6½ to 14½ years of age. A critical study of the arithmetical average is included.

Gihon, A. L. A study of adolescent growth based on the physical examination of 6,129 naval cadets and candidates for appointments as cadets and 2,058 naval apprentices. Report of the Surgeon-general, U. S. Navy. Washington, 1880. p. 15–44.

Gilbert, J. A. Researches on school children and college students. University of Iowa studies in psychology, 1897. v. 1. p. 1–39.

Supplementary to the previous investigation with extra data, especially on dullness and precocity. The curves for height, weight and lung capacity and for dullness and precocity are included. Tests on various mental traits are included.

——— Researches on the mental and physical development of school children. Studies from Yale psychological laboratory. v. 2. p. 40–100.

The curves charted consist of those of the growth of boys and girls; of each sex separately; the mean variation for both sexes, then each sex separately.

Girond, Gabriel. Observations sur le development de l'enfant. Petit guide anthropométrie familiale et scolaire. Paris, Schleicher frères, 1902. 53 p. and tables.

A small guide for the physical observations of children, with a few statistics on growth in weight.

Goddard, H. H. The height and weight of feeble-minded children in American institutions. Journal of mental and nervous diseases, 39:217–235 (1912).

The most comprehensive study, so far published, on the growth, height and weight of feeble-minded children. Four tables and seven charts are included and the data are derived from twenty institutions. Some of the conclusions are that all defectives are heavier at birth than normals; sex differences are less marked as we go down the grades; with the morons there is an arrest of growth earlier than with normals; there is close correlation between physical growth and mental activity.

Gould, B. A. Investigations in the military and anthropological statistics of American soldiers. U. S. Sanitary commission, N. Y., 1869. v. 2. 655 p.

Gratsianoff, ———. Materials for the investigation of physical development in childhood and youth in relation to heredity and to progress in school work. From observations made in Arzamas, province of Novgorod. Inaugural dissertation. St. Petersburg, 1889.

An important study not accessible to the author.

Graupner, ———. Wachstumgesetze der körperlänge nach untersuchung von 57,000 Dresdner schulkinder. Bericht des ersten Internationalen kongresses für schulhygiene, 1904. p. 421–25.

Gray, F. J. Diurnal variations in weight. American physical education review, 15:6–14 (1910).

A thesis presented for bachelor's degree in physical education at the International Y. M. C. A. training school, in June, 1908. After making comparisons with the work of M. A. Burke, H. Carrell, H. Cook, B. B. Forte, C. H. Goodwin, A. Gould, and others, the writer finds that all men gain "during the season." Seasoned athletes gained less during a season of training than green athletes.

Greenleaf, ———. New table of physical proportions. Baltimore underwriter, 43:303 (1890).

A study of the relative proportions of the body.

Greenwood, J. M. Heights and weights of children. *In* Kansas City. Board of education. Report, 1890–91.

See also American public health association. Report, 1892. v. 17. p. 199–204.

The chief value of this study consists in the number of measurements included.

Gregor, W. Galloway folk in Wightshire and Kirkendbrightshire. *In* British association for the advancement of science, 1897. v. 67. p. 500–3.

A comparative study of the heights of 82 men and 34 women, the height for the men averaging 68.25 inches, for the women 63 inches.

Grinevski, A. On the physical development of children. Kvoprosu o fizicheskom vospitanii dietei. Odessa, 1892. 36 p.

Grünbaum, O. F. F. On the physical characteristics of the inhabitants of Barrington and Foxton in Cambridgeshire. *In* British association for the advancement of science, 1897. v. 67. p. 505.

A comparative table showing the height of 23 males varying from 153.3 cm to 174.4 cm.

Gulick, L. Physical measurements and how they are studied. Physical education, 2:140–41; 152–53; 186–91 (1893).

A series of practical suggestions on how to make, record, and study physical measurements.

——— The value of percentile grades. *In* American statistical association (quarterly) 21:321–31 (1893).

A detailed discussion of the theoretical significance and the percentile method of using data.

Haddon, A. C. On the physical characteristics of the inhabitants of Barley, Herts. *In* British association for the advancement of science. Report, 1897. v. 67. p. 504–5.

A number of measurements are included in this report on the observations of 15 males from Barley.

Hall, G. S. Growth in height and weight. *In his* Adolescence. New York, D. Appleton & co., 1904. v. 1. p. 1–50.

The best summary without direct experimental data, up to date, of the problem in height and weight. The work of Boas, Burk, and Wiener is especially emphasized and the more general and interrelated problems of development are treated in a very scholarly and helpful manner.

Hall, W. S. Changes in the proportions of the human body during the period of growth. Journal of the Anthropological institute of Great Britain and Ireland, 25:21–46 (1895).

A study in growth in height of boys in Friends' schools and Haverford college ranging from 9 to 23 years of age. Many other measurements are included and some conclusions in regard to strength. There was a great homogeneity of race, nationality, and social conditions among the individuals in these schools.

Hanna, D. Anthropometric tables compiled from the measurements of 1,600 women (Oberlin students). Oberlin college. Dept. of physical training. Oberlin, O., 1893.

An elaborate series of tables showing many comparative measurements.

Hansen, S. Über die individuellen variation der körperproportionen. Archiv für anthrop., 20:321–23 (1891–92).

This investigation is based on 2,883 cases and gives the results, in tabular and graphic form, of the relation of the length of the foot to the height of the body.

Harrington, T. F. Health and education. American physical education review, 15:373–88 (1910).

Contains, after a discussion on health and ventilation, a study of the weight of 763 boys and 653 girls born in Boston, whose parents were born in Boston and attended the same schools from which Dr. Bowditch secured his measurements in 1876. At the present stage of this investigation the boys are slightly lighter than those of 1876, except at 13 years of age, and the girls are heavier.

Hartwell, E. M. Bowditch's law of growth and what it teaches. *In* American association for the advancement of physical education, 1896. p. 23–30.

Bowditch's law of growth is as follows: "There is a prepubertal acceleration of growth in height and weight, both in males and females, followed by a postpubertal retardation in such growth; and girls when growing most rapidly, exceed boys of like age, in height and weight." It has been thought that Bowditch was the first to note this, but it was previously noted by Dr. Fahrner, who measured 1,789 children for desks.

——— Preliminary report on anthropometry in the United States with provisional list of works relating to anthropometry in the United States. *In* American statistical association. Boston, 1893. v. 3. p. 554–68.

A summary and bibliography of the work in anthropometry in this country.

——— Reports on physical training in Boston public schools. *In* Boston, Mass. School report, 1894–95. p. 181–260.

A careful study of the relation of stature to school work.

Hasse, E. Beiträge zur geschichte und statistik des volksschulwesens von Gohlis Leipzig, Dunker und Humbolt, 1891.

Reprinted from the Report of the city of Leipzig, 1889.

Hastings, W. W. Anthropometric studies in Nebraska. American physical education review, 5:53–66 (1900).

Also in National education association of the United States. Journal of proceedings and addresses, 1899. p. 1076–84.

In this investigation 15 measurements were made on 2,500 public-school children of Nebraska. Conclusions are given as to comparative weights of boys and girls, physical well being and mental efficiency, height and nationality. Tables are given showing average height and weight, for boys and girls, for different ages and different grades.

——— Brief résumé of Quetelet's treatise on man. American physical education review, 3:258–69; 309–18; 366–76 (1898).

A good summary of this book, which is anthropological rather than anthropometrical in its content.

——— Health and growth of school children. *In* National education association of the United States. Journal of proceedings and addresses, 1903. p. 769–75.

A summary which first takes up the methods of ascertaining the normal periodic increase of growth, and secondly, the practical methods of comparing the individual child with this known standard.

——— A manual for physical measurements. New York, Macmillan co., 1902. 112 p.

The best summary from an anthropometrical standpoint so far published. A large amount of comparative material has been included and many practical suggestions given. A good bibliography is appended.

Hergel, G. Was ist auf dem gebiete der körperlichen ausbildung unserer mittelschuljugend erreichbarŏ Zsch. für schulgesundheitspflege, 10:333–34 (1897).

A brief discussion leading to other papers on physical training.

Hertel, A. Neuere untersuchungen über den allegemeinen gesundheitszustand der schüler und schülerinnen. Zsch. für schulgesundheitspflege, 1:167–83; 201–15 (1888).

A comparison is made between age, height, and diseases of children between the ages of 6 and 17 as shown by Hertel's report, a report of the Danish commission and a report of the Swedish commission. The emphasis in the article is placed on the relation of disease to physiological growth.

——— Overpressure in high schools of Denmark. Tr. by Godfrey Sorenson. New York, Macmillan co., 1885.

This is an English translation of Hertel's book which discusses the question of growth and prevalence of chronic diseases among children of different ages.

——— The report of the Danish commission. (1882.)

This report takes up age, length of work, time at home and school, height, weight, and the common diseases, and a comparison is made between the pupils in the higher and the volkschulen. 17,595 boys and 11,646 girls were included, both in Copenhagen and in the country.

Hess, W. Bestimmung des gewichtes und messungen der körperlänge bei einem kinde im ersten und zweiten lebensjahre. Archiv für gynaekologie, Berlin, 17:150–52 (1881).

Hitchcock, E. (a) Anthropometrical data based upon nearly 3,000 measurements taken from students. Amherst, 1888.

Included in program of exhibition of physical exercises (a, b, c, d, e).

——— (b) Average and mean anthropometric data of Amherst college students. Amherst, 1888.

A series of elaborate tables.

——— (c) The gain in physical strength of college students. Amherst, 1892. Two tables.

——— (d) Physical growth of Amherst students. Gain between freshman and senior years. Amherst, 1892.

——— (e) The distribution of physical measurements shown in the different years of college life. Amherst, 1892.

——— Anthropometric statistics of the students of Amherst college. *In* American statistical association. (Quarterly publications) Boston, 1893. v. 3. p. 588–99.

A summary of the statistical work of the department of physical education.

Hitchcock, E. Comparative study of measurements of male and female students at Amherst, Mt. Holyoke and Wellesley colleges. *In* American association for the advancement of physical education, 1891. v. 6. p. 37–42.

A discussion of Dr. Bowditch's paper on percentile grades, accompanied by three tables. The first table gives the average measurements of 2,000 students; the second, the means rather than the averages for 2,086 students; and the third, the average measurements of 326 college men between 21 and 22 years of age.

——— The need of anthropometry. *In* American association for the advancement of physical education, 1887. v. 3. p. 3–8.

A discussion of the history of anthropometry, together with suggestions on how to take measurements accurately.

——— Physical measurements, fallacies and errors. *In* American association for the advancement of physical education, 1887. v. 3. p. 35–42.

Dr. Hitchcock reaches the conclusion in this discussion that "human measures increase with height, always understanding that the law will not include some of the tests of strength." A criticism of the Hemenway charts is also included.

——— The result of anthropometry as derived from the measurements of the students in Amherst college. Amherst, Mass., Carpenter & Morehouse, 1892. 7 p.

Contains several reports.

——— A synoptic exhibit of 15,000 physical examinations. *In* American association for the advancement of physical education, 1890. v. 5.

——— Seeley, H. H., *and* Phillips. The anthropometrical manual of Amherst college. Amherst, Mass., Carpenter & Morehouse, 1900. 40 p.

Holmes, B. Order of physical growth of the child. *In* Illinois society for child study. Transactions, 1897. v. 11. p. 201–15.

This article deals primarily with the influences affecting growth and gives two of Porter's tables.

———A study of the growth of children, being a review of the work of Dr. Wm. T. Porter of St. Louis. New York medical journal, 60:417–23 (1894).

A critical discussion of Dr. Porter's work.

Hrdlička, A. Anthropological investigations on 1,000 white and colored children of both sexes. *In* New York juvenile asylum. 47th annual report. New York, Hollenbeck Crawford co., state printers, 1899. v. 47. p. 1–86.

The author finds these children slightly inferior to healthy children from good homes but attributes it to neglect and improper nutrition. The report contains the results of much painstaking anthropometrical research and a discussion on the stigmata of degeneration.

Hudson, G. H. A plea for a more general recognition of phenomena of child growth in education. Education, 14:466–77.

A general discussion in growth without empirical data or measurements, emphasizing the recapitulation theory.

Hurd, K. C. On anthropometry. Times and register, N. Y. and Phila., 7:506–11 (1890).

This article takes up the question of the method and value of anthropometry and gives the data used in Galton's Anthropometric laboratory. The author begins by making a plea for compulsory anthropometry in our schools.

——— Some of the Francis Galton tests concerning the origin of the human faculty. *In* American association for the advancement of physical education, 1891. v. 6. p. 80–96.

An application of Galton's measurements to Bryn Mawr schools and Bryn Mawr college, including some anthropometric measurements.

Hutchinson, John. Contributions to vital statistics obtained by means of pneumatic apparatus for valuing the respiratory powers in relation to health. Quarterly journal of the statistical society, London, 7:193–212 (1844).

Included on account of the statistics and for the historical value.

——— On the capacity of the lungs and on the respiratory functions, etc. Medical chirurgical transactions, London, 29:137–252 (1846).

A very good pioneer study in lung capacity.

Jackson, W. A., *jr*. Graphic methods in anthropometry. Physical education, 2:89–94 (1893).

Diagrammatic charts on physical growth and proportions of different parts of the body.

Jackson, W. A., *jr.* Tables of the anthropometric measurements of the Williston seminary students. The Willistonian, Easthampton, Mass. (1892). p. 140.

Karnitsky, A. C. Zur physiologie des wachstums und der entwicklung des kindlichen organismus. Jahrbuch für kinderheilkunde, 68:462–74 (1908).

Karstädt, F. Über das wachstum der knaben vom 6. bis 16. lebensjahre. Zsch. für schulgesundheitspflege, 1:69–74 (1888).

The growth of boys in height furnishes the object of this study. It is based on 4,274 semiannual measurements over the years from 6 to 16 (not consecutive measurements on the same individual). Maximum and minimum heights and increments are given. The measurements were taken in the Höhren burgerschule I in Breslau.

Kellogg, J. H. Outline studies of the human figure, comprising 118 figures which embody the results of several thousand observations, embracing studies of a number of different civilized and uncivilized races. Chicago, Battle Creek, Mich. [etc.], Mod. med. pub. co., 1893.

——— The value of strength tests in the prescription of exercise, and a comparative study of the strength of individual groups of muscles, and of homologous muscles of men and women. *In* American association for the advancement of physical education, 1896. p. 49–75.

The value of strength tests in the prescription of exercise, and a comparable study of the strength of individual groups of muscles and of homologous muscles, in men and women, are given in this report. Many physical measurements of different parts of the body are included.

Key, Axel. Läroverkskomiténs betänkande, III. Bilage E. Kongl. boktrycheriet. Stockholm, 1885. 2 v.

Edited in German by Bürgerstein. Schulhygienische untersuchungen, Hamburg, 1889.

A report of the Swedish commission of which Key was appointed chairman in 1882. About 15,000 boys and 3,000 girls were examined. Most of the book is concerned with hygienic investigations and an important contribution is made bearing on the relation of disease to nodes of growth. The study of the height and weight extends from the age of 6 to 20 years.

——— Die pubertätsentwicklung und das verhältnis derselben zu den krankheitserscheinungen der schuljugend.

Reprinted from the proceedings of the 10th International congress of medicine, 1890. v. 1. p. 66–130.

——— Schulhygienische untersuchungen. Leipzig und Hamburg, L. Bürgerstein, 1889. 346 p.

Key found in Sweden that liability to sickness decreases with increasing rate of growth, and increases with decreasing rate of growth; therefore one may be taken as the measure of the other.

King, I. Measurements of the physical development of two children. Journal of educational psychology, 1:279–86 (1910).

An important individual study of the author's two boys, one between the ages of birth and 6 years, and the other for the first three years. Fourteen measurements besides height and weight are included.

Kirchhoff, A. Zur statistik der körpergrösse in dem Saalkreise zu Halle und dem Mansfelder Seekreise. Archiv. für anthrop., Braunschweig, 21:133–43 (1892–93).

In this investigation, which was carried on in 1882, Dr. Kirchhoff makes some very interesting comparisons. 2,637 measurements were made in the Saalkreise and 2,812 on the Seekreise.

In a distribution chart arranged on Eisenben the proportion was 1,520 millimeters to 1,880 millimeters as compared with 1,520 to 1,765 on Köennern.

Kirkpatrick, E. A. Physical growth and development. (Fundamentals of child study.) New York and London, Macmillan co., 1907. p. 15–30.

A brief but suggestive discussion on the general problem of growth.

Kosmowski, W. Über gewicht und wuchs der kinder der armen in Warschau. Jahrbuch für kinderheilkunde, 39:70–76 (1895).

Kottelman, L. Die körperverhältnisse der gelehrtenschüler des Johannaeus in Hamburg. Zsch. des königlichen preussichen statistischen bureaus, Berlin (1879).

An important investigation based on measurements in height, weight, and lung capacity of 115 boys from 10 to 15 years of age.

Landsberger, ——. Das wachstum der knaben vom 6. bis zum 13. lebensjahre. Zsch. für schulgesundheitspflege, 1:65–69 (1888).

See Karstädt.

An important investigation based on consecutive measurements of 37 children between the ages of 6 and 13. Many other measurements are included and a comparison is made with the work of Bowditch and other investigators.

Landsberger, ——. Das wachstum im alter der schulpflicht. Archiv für anthrop., Braunschweig, 17:229–64 (1888).

A report of the growth of 104 children through a period of five years.

Lane, W. A. Some of the laws which influence the growth of children. *In* International congress of hygiene. Proceedings. London, 1892. p. 103–9.

A general discussion.

Lange, E. Die gesetzmässigheit im langenwachstum des menschen. Jahrb. der kinderheilkunde, 57:261–324 (1903).

Lee, A., *and* P. K. Data for the problem of evolution of man. *In* Royal society. Phil. transactions. London, 1901. v. 196. p. 225–64. Series A.

A good treatment of the general problem of physical development.

Lee, C. A. A table showing the physical characteristics of the United States Senate. Buffalo medical and surgical journal, 6:390–96 (1866–67).

Leshaft, ——. Materials for the study of the years of school life. Health (1879–80). p. 127–31.

Russian, cited by Sack.

Liharzik, F. Der bau und das wachstum der menschen. Sitzungsberichte d. königlichen akademie in Wien. Mathematisch-naturwissenschaftliche klasse, abtheilung, 2:44 (1861).

——— Das gesetz des menschlichen wachstums. Wien, Carl Gerolds sohn, 1858. 188, cxvi.

A good pioneer study of measurements of the head and chest.

Lincoln, D. F. Anthropometry individualized. *In* American association for the advancement of physical education, 1896. p. 4–11.

A practical paper with some very good observations on sexual maturity.

Macdonald, Arthur. Experimental study of children. *In* U. S. Bureau of education. Report of the Commissioner for the year 1897–98. v. 1. p. 989–1204. v. 2. p. 1281–1390.

An extensive study of numerous physical and mental measurements of white and colored children in Washington. A number of comparisons of head measurements are made, and it is concluded that white girls have a greater standing height and sitting height than colored girls, but colored children have a greater weight than white children. Children of the laboring class are superior in height, sitting height, and weight to those of the nonlaboring class, which confirms the results of Roberts, Bowditch, and Baxter. Girls are superior to boys in their studies. Children with abnormalities are inferior in height, weight, and the other measurements included.

Many charts, tables, and illustrations are given, and a bibliography is appended.

——— Neuere amerikanische arbeiten auf dem gebiete der kinderforschung. Zsch. für pädagogische psychologie, 2:112–21 (1900).

——— Über körpermessungen an kinder. Deutsche zsch. für ausländisches unterrichtswesen, 4:253–66 (1899).

A translation of the previous article.

Malling-Hansen, P. R. Einige resultate der täglichen wägungen von 130 zöglingen des königlichen taubstummeninstituts in Kopenhagen. *In* Congrès périodique international des sciences médicales, Kopenhagen. v. 3. p. 103–19.

This is an address covering the subject of seasonal variations, and a consideration of the effect of change of diet on growth in weight at different times of the year.

——— Perioden im gewicht der kinder und in der sonnenwarme beobachtungen. Kopenhagen, 1886. Fr. 3. p. 268.

——— Uber periodicität im gewicht der kinder an täglichen wägungen. Kopenhagen, 1883. v. 1. p. 35.

An extensive and careful treatment of the seasonal period of growth.

——— Uber periodizität im gewicht der kinder. Kopenhagen, 1883. 35 p.

Deals primarily with the seasonal and daily variations in growth due to climatic conditions.

Meek, K. Volummessungen des menschlichen körpers und seiner einzelnen theile in den verschiedenen alterstufen. Zsch. für biologie, Munchen und Leipzig, 31:125–47 (1894).

Mereshoffsky, K. On the results and methods of the investigation of the physical development of children.

Brochure. Russian, cited by Sack. Not accessible to the writer.

Meuman, E. Vorlesung zur einführung in die experimentelle pädagogik. Leipzig, Engelmann, 1911. 725 p.

The third chapter of this book contains a very valuable chapter on growth. A bibliography is appended.

Michailoff, ———. Materials for the estimation of physical development and disease in the village school of Russik in the province of Moscow. Moscow, 1887.

Russian, cited by Sack. Not accessible to the writer.

Misawa, Tadasu. A few statistical facts from Japan. Pedagogical seminary, 16:104–12 (1909).

In 1901 the Department of education of Japan measured the heights and weights for 869,014 children and Dr. Misawa reports the results of this study in the above article.

Miwa, Norhiva. A study upon weight from 3 to 80 years of age. Tokio I—Gauk—Zwai—Zatumshi (1893) v. 7. no. 9.

These measurements begin in the kindergarten and extend through the schools and to adults from other sources. A study of the effect of the weights in different classes of society is included, together with the problem of maturity.

Moon, S. B. The growth of boys. *In* American association for the advancement of physical education, 1896. p. 19–23.

A brief article giving the measurements in a percentile table for 150 boys who are measured annually from 11 to 15 years of age.

——— Measurements of the boys of the McDonogh school for 1881–91. McDonogh school, Md., 1892. 46 p.

——— The question of growth at puberty. American physical education review, 4:294–98 (1899).

Data are given with a view of testing Bowditch's law specifically in regard to retardation before pubescent acceleration. The law is not satisfactorily confirmed. It is concluded that "pubertal attainment has but little, if any, effect upon the rate of growth, at least in many cases."

Morey-Errant, D. Unity of the periods of growth in a man. *In* Illinois society for child study. Transactions, 1898. v. 4. p. 84–91.

A general discussion bearing primarily on puberty.

Morse, W. H. The baby's growth. Virginia medical monthly, 13:392–95 (1886–87).

A brief study of the weight of infancy, showing the comparative stages of physical development.

Muller, G. Alphonse Bertillon's method for the identification of criminals. Anthropometric identifications. Instructions for taking measurements and descriptions. Joliet, Ill., 1887. v. 8. p. 84.

A ractical guide for criminologists.

Nagorsky, ——. The influence of schools on the physical development of children. St. Petersburg, 1881.

Russian, cited by Sack. Not accessible to the writer.

Oppenheim, N. Development of the child. New York, Macmillan co., 1898. p. 1–92.

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Pagliani, L. Sopra alcuni fattori dello sviluppo umano-richerche anthropometriche. *In* Atti dell r. Accad. di scienze di Torino, 1875–76. v. 11. p. 694–760.

Also in Arch. di anthrop. ed etnol. italiana, 6:129–83 (1876).

These children were examined and measured in Turin and the accompanying tables give the effect of growth under favored and under less favored conditions, together with the effect of exercise on the development of the lung capacity of boys.

——— Lo sviluppo umano per età, sesso, condizione sociale ed etnica studiato nel peso, statura, circonferenza toracica, capacita vitale e forza muscolare. Giornale della Società italiana d'igiene, Milano, 1: no. 4, 357–76; no. 5, 453; no. 6, 589–608 (1879).

Paillot de Montabert, M. P. Traité complet de la peinture. Paris, J. F. Delion, 1828–29. 662 p.

Pearson, K. Growth of St. Louis children. Nature, 51:145–46 (1894).

In this investigation Dr. Pearson summarizes Galton's percentile methods and says that it is now acting as a distinct hindrance to statistical theory in an unexpected way, since it does not require the investigator to publish his raw material. A criticism is given of Dr. Porter's work on this basis, since the material is only given in the form of percentiles or in diagrams of the "Orgive" curve corresponding to the integral of the frequency curve.

Peckham, C. W. The growth of children. *In* Wisconsin. Board of health. Report, 1881. v. 6. p. 28–73.

About 10,000 children in the various schools of Milwaukee were measured and examined in 1881, ranging in age from 4 to 18 years. Eleven plates and 13 tables giving the rates of growth by nationality are included.

——— Various observations on growth. *In* Wisconsin. Board of health. Report, 1882. v. 7. p. 185–88.

This investigation showed there were certain important differences in the rates of growth of Boston children and Milwaukee children.

Porter, W. T. Anthropometrical measurements in schools. Educational review, 11:126–33 (1896).

A practical discussion of the study of physical growth from the educational standpoint.

——— The growth of St. Louis children. *In* American statistical association. (Quarterly publications), 1894. v. 4. n. s., p. 28–34.

Also in Academy of science of St. Louis, 1894. v. 6. p. 263–380.

This is one of the most significant investigations so far made, including measurements in height, weight, and span of arms, strength, girth, measurements of face and head, based on 34,354 children. A careful discussion of statistical measurements is included. There are 51 tables given in percentile grades and 46 plates. A bibliography is appended.

——— On the application to individual school children of the mean values derived from anthropological measurements by the generalizing method. *In* American statistical association. Boston, 1892–3. v. 3. n. s., p. 576–87.

A discussion of the significance of deviations above or below normal height and the requirements of a proposed system of physical measurements.

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In this investigation, which is based on the previous one, Dr. Porter gives 15 tables and 2 charts, tracing the development by age of dull, mediocre and precocious boys and girls and maintains that "Precocious children are heavier and dull children are lighter than mean children of the same age."

——— The relation between the growth of children and their deviation from the physical type of their sex and age. *In* Academy of science of St. Louis. Transactions, 1893. v. 6. p. 263–80.

In this investigation Dr. Porter compares the growth of the school children in the Freiburg with those in St. Louis and concludes: "The psychological difference between the individual children in an anthropometric series and the physical type of the series is directly related to the quickness of growth."

——— Remarks on the use of anthropometrical instruments in schools. *In* American association for the advancement of physical education, 1896. p. 158–64.

In this article Dr. Porter bases his discussion on the fact that "the average or other central value of the group of properly related measurements gives an idea of the character of the group." Emphasis is laid on types, and we are told that percentile grades can not be used as yet for prediction of future size.

It is recommended that the annual record of the height and weight of every pupil be kept, and that all pupils, whose height and weight ratio is above the 75 or below the 25 percentile grade of their age, be placed under special supervision in order that they may not be overtaxed by the work required of normal pupils.

——— Untersuchungen der schulkinder in bezug auf die physischen grundlagen ihrer geistigen entwicklung. Verhandlungen der Berliner anthropologischen gesellschaft (1893). p. 337–54.

A translation of the former article.

Quetelet, M. A. De la statistique considérée sous le rapport du physique, du moral et de l'intelligence de l'homme. *In* Commission centrale de statistique. Bulletin. Bruxelles, 1860. v. 8. p. 433–67.

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Quetelet, M. A. Des proportions aux corps humain. Académie royale des sciences, des lettres, et des beaux-arts de Belgique. Bulletin. Bruxelles, 1848. v. 15. p. 16–27.

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——— Recherches sur le poids de l'homme aux différents ages. *In* Académie royale des sciences, des lettres et des beaux-arts de Belgique. Bulletin. Bruxelles, 1832–34. v. 1. p. 20–24.

——— Sur l'homme et le dévelopment de ses facultés, ou essai de physique sociale. Paris, Bachelier, 1836.

Pioneer work in the field of anthropometry, which studies records from the standpoint of an artist as well as of a scientist.

——— Sur les Indiens Ojib-be-was et les proportions de leur corps. Académie royale des sciences, des lettres, et des beaux-arts de Belgique. Bulletin. Bruxelles, 1846. v. 13. p. 70–76.

A brief scientific study of three Indians.

——— Sur les proportions de la race noire. *In* Inter. cong. f. sch. hyg., 1854. v. 21. p. 96.

——— Sur les proportions de hommes, qui se font remarquer par un excès ou un défaut de taille. *In* Académie royale des sciences, des lettres, et des beaux-arts de Belgique. Bulletin. Bruxelles, 1847. v. 14. p. 138–42.

A short summary with references to Ojib-be-was Indians.

Quirsfeld, E. Untersuchungsergebnisse physischer und geistiger entwicklung bei 1014 kindern vom 1. bis. 8. schuljahre. Prager med. wochnschr., 32:653–56 (1907).

Translation in International congress on school hygiene. 2d. London, 1907. Proceedings. p. 214–16.
A study of the physical and mental development in early childhood.

——— Vorträge: Zur physischen und geistlichen entwicklung des kindes während der ersten schuljahre. *In* Inter. cong. f. sch. hyg., 1904. v. 3. p. 128–34.

A careful study of physical conditions of children during the first years of school, followed by a discussion by F. A. Schmidt, E. Bayr, and Frau Dr. Krukenberg.

Ranke, O. Beiträge zur frage des kindlichen wachstums. Archiv. für anthrop., 3:161–80 (1905).

See also Der Mensch, 2:156–57.
A very careful study of about 2,500 children, with many measurements and tables.

——— Der Ménsch. Leipzig, Verl. d. bibl. Instit, 1894–1900. 2v.

Chapters 2 and 3 of vol. 2 contain excellent material on growth and many tables from Europe and America. An excellent treatise.

Reuter, F. Beiträge zur anthropologie Hinterpommerns. Kindermessungen. Archiv. für anthrop., 28:288–388 (1903).

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Richards, A., *and* Little, B. B. A proposed standard chart to show the proportions of American females. *In* American association for the advancement of physical education, 1896. p. 30–34.

A detailed chart is given showing relative measurements.

Rietz, E. Das wachstum der Berliner schulkinder während der schuljahre. Archiv. für anthrop., 1:30–42 (1903). neue folge.

This investigation is based on a study of 5,134 Berlin boys and girls between the ages of 6 and 19, and includes the comparison between children from different types of schools. Twelve tables are included and one chart, with corresponding curves for the gymnasien and höhere schulen and the gemeindeschulen. A comparison is also made between the children of the better classes and the poorer classes at Hamburg, Berlin, Halle, Gohlis, Saalfield, Stockholm, Denmark, England, Boston, Turin, Warsaw, and Freiberg as outlined by Burke, but less complete, the numbers of individuals not being included.

——— Körperentwicklung und geistige begabung. Zeitschrift für schulgesundheitspflege, 19:65–98 (1906).

Roberts, C. Manual of anthropometry. London, L. Churchill, 1878. 118 p.

This is an important manual containing much anthropometric material and an extensive bibliography. The height, weight, and annual increments of 7,709 boys and men of favored class between 10 and 30 are included. There are also many other tables, one including height, weight, and chest girth of newborn infants; another of the average height, weight, and chest girth of the artisan class between the ages of 4 and 50. A careful comparison is made with Dr. Bowditch's work in Boston.

Roberts, C. Memorandum on the medical inspection and physical education in secondary schools. *In* Royal commission on secondary schools of England. Report. v. 5. p. 352–74.

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Ruschenberger, W. S. W. Contributions to the statistics of human growth. American journal of medical science, Phila., n. s. 54:67–70 (1867).

Russow, A. Vergleichende beobachtungen über den einfluss der ernährung mit der brust und der künstichen ernährung auf das gewicht und den wuchs (länge) der kinder. Jahrb. für kinderheilkunde, Leipzig, 16:86–132 (1880–81).

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Sargent, D. A. The physical proportions of the typical man. Scribner's magazine, 2:3–17 (1887).

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——— The physique of scholars, athletes, and the average student. Popular science monthly, 73:248–56 (1908).

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——— Report on the anthropometric measurements. A schedule of measurements with directions for making them. *In* American association for the advancement of physical education, 1886. v. 2. p. 6–15.

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——— Hitchcock, E., *and* Anderson, W. G. Report of the committee on statistics appointed by the association in 1885. *In* American association for the advancement of physical education, 1888.

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Schmidt, Emil. Die körpergrösse und das gewicht der schulkinder des kreises Saalfeld. Archiv. f. Anthrop., 21:385–434 (1892).

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In an investigation made in Halle on 5,100 boys and 3,200 girls in the high and middle schools, the writer studied the chronic diseases, fatigue, etc., in respect to effects, and growth in height and weight in individual children through the fourteenth year.

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Seaver, J. W. Anthropometry and physical examination, for practical use in connection with gymnasium work and physical education. Meriden, Conn., Curtis-Way co., 1909. 191 p.

This is an important contribution to the general subject of anthropometry and contains 15 chapters on various anthropometric subjects. Chapters 7, 8, and 9, in graphic anthropometry, the law of growth, and percentile methods of tabulation, are particularly good. A number of important charts and tables are included.

——— Anthropometric tables arranged from the measures of 2,300 students. New Haven, 1889.

Sergi, G. An anthropological cabinet for pedagogic purposes. Education, 7:42–49 (1886).

In his discussion on the formation of an anthropological cabinet Dr. Sergi gives a detailed biographical chart, including both physical and mental observations, together with remedial agencies and educational measures.

Shbankoff, ———. The influence of the common school on the physical development of pupils. Messenger for legal medicine. v. 3. (1889.)

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Shortt, John. Differences in weight and stature of Europeans and some natives of India. *In* Ethnological society. Transactions. London, 1863. v. 2 n. s. p. 213.

Shuttleworth, G. E. The health and development of idiots compared with mentally sound children of the same age. *In* Association of medical officers of American institute for idiotic and feeble-minded persons. Proceedings, 1876–86. p. 315–22.

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Silbermann, J. T. Proportions physique ou naturelles du corps humain exprimées en mesures métriques et rapportées à la taille de 1.60 m. *In* Académie des sciences. Compt. rend. Paris, 1856. v. 42. p. 454–56, 495–97. v. 43. p. 1156–57.

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Smedley, F. W. Report of department of child-study and pedagogic investigation of the Chicago public schools. Chicago, 1900. v. 2, p. 10–48.

This report is the continuation of the work started by W. S. Christopher. It contains tables and charts of norms resulting from the measurement of height, weight, vital capacity, grip, and the use of the ergograph with Chicago public school children, and a discussion of the correlation between these results and school standing.

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Stanway, S. Results of investigations made into the comparative health and condition of factory and non-factory children in Manchester and Stockport. Report of Factory commission. London, 1833.

Mr. Conwell, chairman.

Sternberg, G. Physique of accepted recruits and reenlisted men of United States army. *In* report of the Surgeon general, U. S. A., to Secretary of war, Washington, 1893. v. 20. p. 226–27.

Stevenson, W. On the rate of growth in children. *In* 9th International medical congress. Transactions. Washington, 1887. v. 3. p. 446–52.

——— On the relation of weight to height and the rate of growth in man. Lancet-clinic, London, 2:560–64 (1888).

In this scientific report Dr. Stevenson gives 4 tables and 2 charts, and maintains that had we the means of scientifically comparing the relation of weight to height and of drawing conclusions therefrom, such data would be as frequently supplied as is now the daily temperature. The first table checks up the height and weight in inches with yearly increments for boys and girls between the ages of 5 and 18. The height and weight indices are also given, and a comparison between the height and weight coefficients of laboring and nonlaboring classes.

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Stratz, C. H. Der körper des kindes, für eltern, erzieher, ärzte und künstler. Stuttgart, 1903. 250 p.

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Steet, G. C. Notes on the development and growth of boys between 13 and 20 years of age. *In* St. Georges hospital, London. Report, 1874–76.

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Swain, F. Anthropometric measurements. *In* American association for the advancement of physical education. Proceedings, 1887. v. 3, p. 43–50.

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Tarbell, G. G. On the height, weight, and relative rate of growth of normal and feeble-minded children. *In* Association of medical officers of the American institute for idiotic and feeble-minded persons. Proceedings, 1876–86. p. 188–89.

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——— ——— *In* Assoc. med. Proceedings, 1888–89.

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Taylor, J. J. Anthropometric notes on the inhabitants of Checkheaton, Yorkshire. *In* British association for the advancement of science, 1897. v. 67, p. 507–10.

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Taylor, J. M. The influence of bodily exercise upon length of life. *In* American association for the advancement of physical education, 1897. v. 7, p. 61–74.

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Thorndike, E. L. An introduction to the theory of mental and social measurements. New York, Science press, 1904. p. 212.

An excellent book on how to handle mental, social, and physical measurements. Chapter 12 treats of the sources of error in measurements, and Chapter 13 gives conclusions and further references.

——— Physical growth of children. *In* Notes on child study. New York, 1901. p. 21–30. (Columbia university. Contributions to philosophy, psychology, and education.)

A very suggestive and valuable chapter, which serves to answer the question "just at what rate do children grow and what are the sizes they reach year after year?" Boas' averages and mean variations are included and distribution figures for different ages, also a series of yearly increments for growth in stature for boys and girls.

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This is an important study containing 278 tables and 43 diagrams.

Vierordt, H. Anatomische, physiologische und physikalische daten und tabellen. 3. neu bearbeitete auflage. Jena, Fischer, 1906. 622 p.

Vierordt, Karl von. Physiologie des kindesalters. Tübingen, Laupp, 1881. 496 p.

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Villermé, L. Note sur la taille moyenne des habitants de Paris et sur les proportions des difformités et infirmités qui les rendent impropres aux services militaires. Annales des sciences naturelles, Paris, 11:140 (1829).

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——— Report on the physical and mental condition of 50,000 children seen in 106 schools of London. *In* U. S. Bureau of education. Report of the Commissioner for the year 1890. v. 2. p. 1081–1138.

An important report prepared for the British medical association and the Charity organization society of London, and preliminary to the data included in the author's study of children.

——— The study of children and their school training. New York, Macmillan, 1897. p. 16–33.

Weiner, C. Über das wachstum des menschlichen körpers. Karlsruhe, 1890. p. 3–23.

A monograph containing curves and tables giving the annual measurements in height, weight, and head girth of Dr. Weiner's four sons from birth to maturity. A very valuable contribution.

Weissenberg, S. Das wachstum des menschen. Stuttgart, Strecker und Schröder, 1911. 220 p.

This is the most important recent publication on physical growth and contains chapters on foetal growth, the proportions of the bodies of babies, growth during the periods of childhood, the conditions influencing growth, and the laws of growth. Many authorities are quoted, numerous tables are included, and charts showing the growth of different parts of the body, together with the relative heights and height increments of Jews, Russians, Englishmen, and Belgians.

Welker, F. Untersuchungen über bau und wachstum des menschlichen schädels. Leipzig, W. Engelmann, 1862.

West, G. M. Anthropometrische untersuchungen über die schulkinder in Worcester, Mass. Archiv. für anthrop., 22:13–48 (1894).

This is a more detailed and elaborate study of the data included in the previous investigation.

———. Growth of the human body. Educational review, 12:284–89 (1896).

A general discussion from the educational point of view.

——— Observation of the relation of physical development to intellectual ability, made on the school children of Toronto, Canada. Science, n. s., 4:156–59 (1896).

In this investigation the results are opposed to those of Dr. Porter. In place of using school grade as the criteria index of precocity, Dr. West uses the teacher's judgment, and appends a number of curves without figures, giving the relative sizes of good and poor students.

——— Worcester school children; growth of head, body, and face. Science, 21:2–4 (1893).

This investigation is based on several measurements including the weight and height of 3,352 children between the ages of 5 and 21 in public and private schools of Worcester.

Whipple, G. M. Manual of mental and physical tests. Baltimore, Warwick, and York, 1910. 534 p.

From the standpoint of education this is the most important contribution now accessible on the general subject of mental and physical tests. Chapter 2 treats of the general rules for the conduct of tests; chapter 3, the treatment of measures; chapter 4, physical tests. The averages of Boas (Burke) and Smedley are used as nomes.

Windle, B. C. A. Anthropometric work in the schools. Medical magazine, London, 2:631–49 (1894).

Wissler, C. Correlation of mental and physical facts. Psychological review (monographs) 3:1–62 (1899–1901).

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This is a very important contribution to the study of growth based on the correlation of increments of growth in height and weight for 72 boys for the periods from 12 to 17 years of age.

"The real problem in studies of growth is the determination of the annual increments during the period of growth for each degree of adult stature. Until we have sufficient measurements to tell us how the tall men and likewise the short men grew in boyhood, we can form no idea of the significance of any given part of the growing period. Thus far our knowledge of growth, as determined by physical measurements of children, is based on average statures obtained by single measurements of large groups of children. We thus gain a certain general curve of growth from which we infer certain tendencies to periodic growth. In all such measurements we have ample means for determining the variation between individuals at each period of life, but no way of estimating the degree of variation in the same individual from year to year. Thus, while we know that the average maximum increase in the stature of boys occurs about the fourteenth year of life, we have no means of knowing how many boys reach their maximum before or after this point."

No imprints of these tables (a, b, c, d, e) were made and the data are inaccessible.

Wood, M. A. (a) Anthropometric table compiled from the measurements of 1,100 Wellesley college students arranged according to bodily heights. (1890.) (No imprint.)

——— (b) Statistical tables, showing certain measurements of 40 freshmen of Wellesley college at the beginning of November, 1891, and the end of May, 1892, after six months of gymnasium training. (1892.) (No imprint.)

——— (c) Statistical tables concerning the class of 1891 of Wellesley college, numbering 104 women. (No imprint.)

——— (d) Six comparative tables showing records of class crews receiving training in gymnasium and on the lake; of 20 students receiving training in the gymnasium; and of 20 students receiving no training in the gymnasium. Wellesley college. President's report. Boston, 1893. p. 35–40.

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